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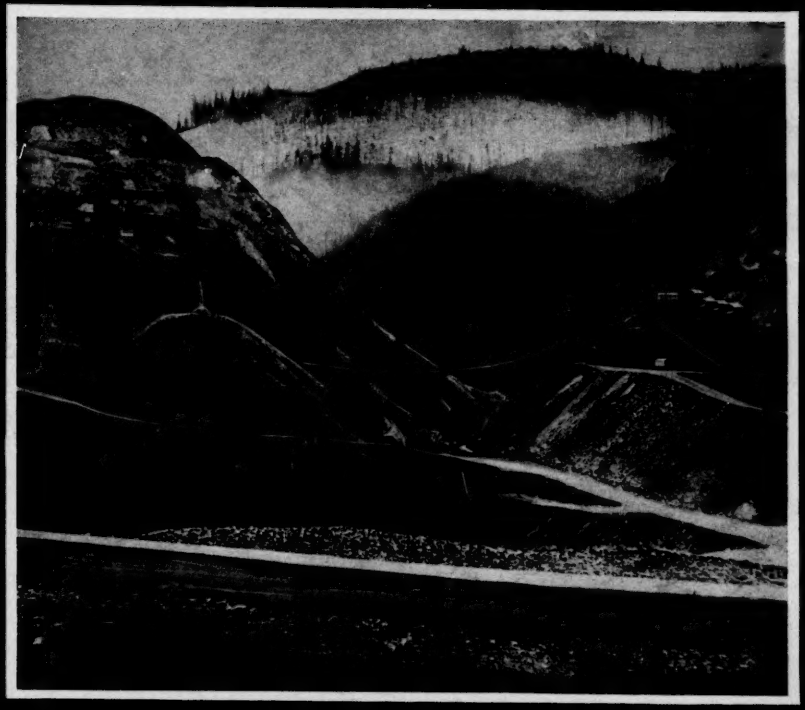

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JUNE • 1951

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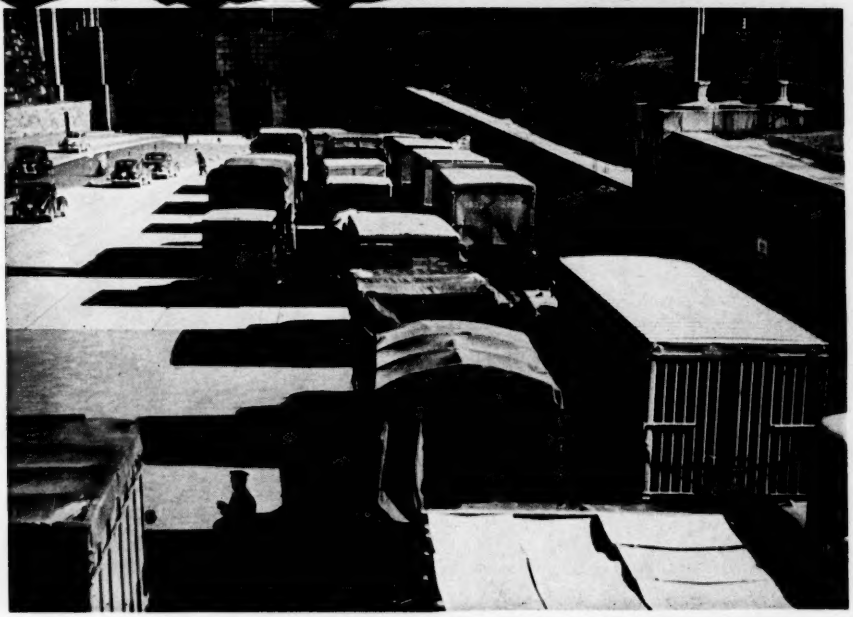

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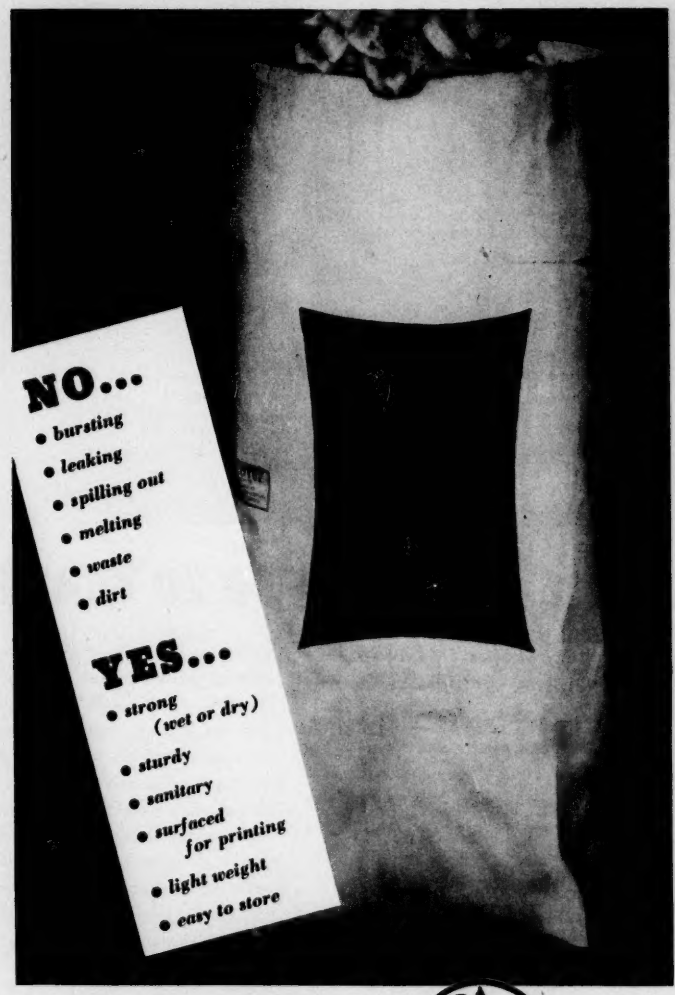

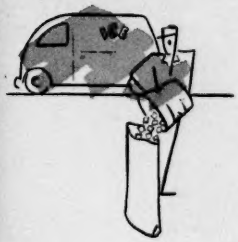

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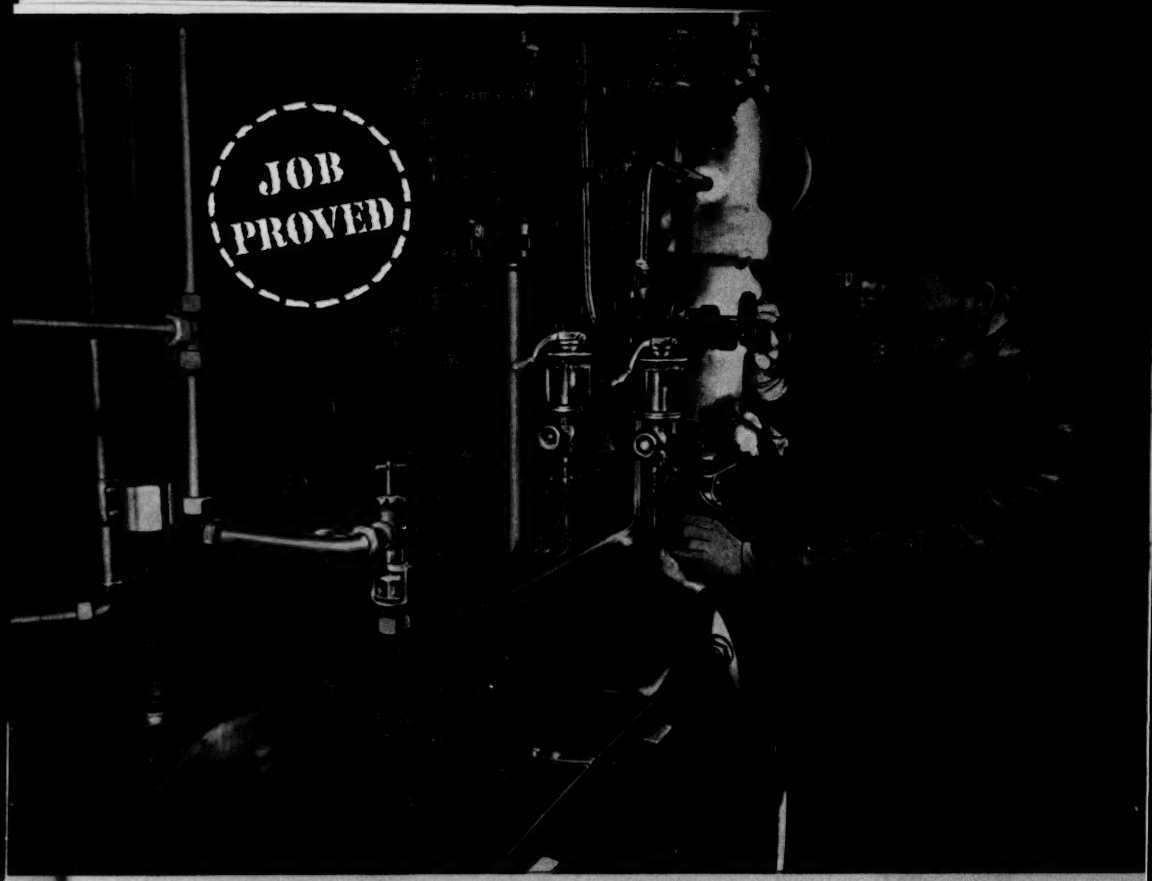

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June 1951

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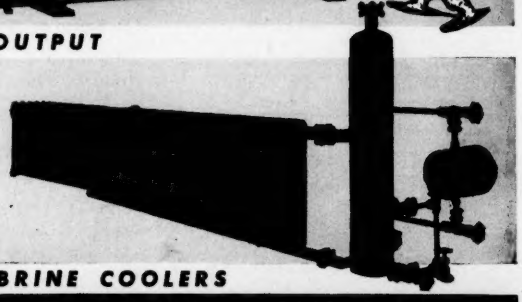

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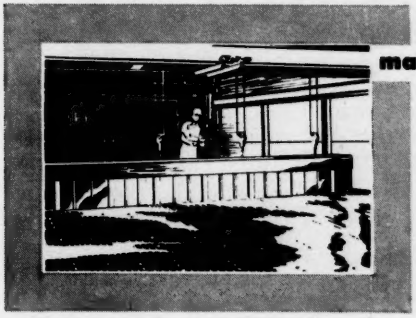

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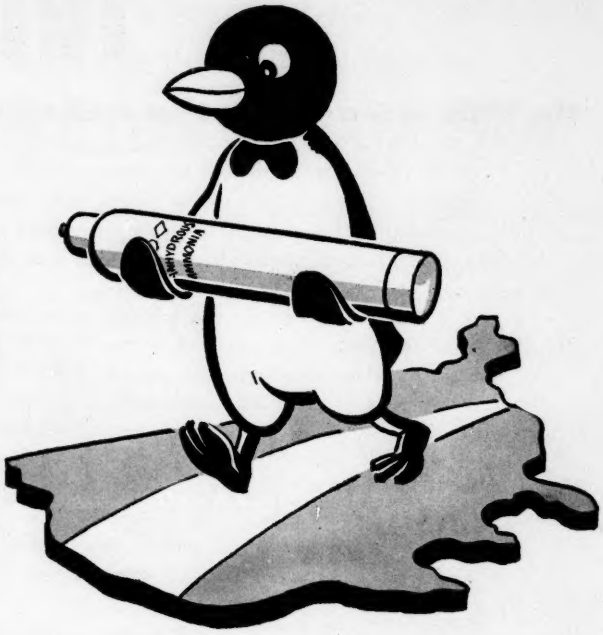

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Right: H. T. Holbrook inspects sample of Palco Wool Insulation removed from freezer wall. Original quality was retained.

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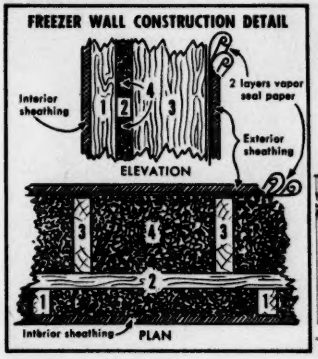

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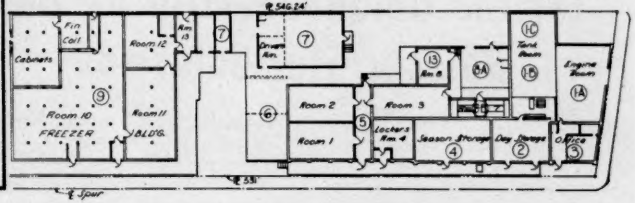
3 2"x8" exterior wall studs
4 13" thickness PALCO WOOL

Below is a portion of the ground floor plan of the Union Ice Company's Santa Cruz plant. Inset at left shows freezer wall detail. Exterior wall is supported by 2" x 8" studs on 16" centers. 2" x 3" interior wall studs are on 24" centers, and are separated from exterior studs by 2" x 3" horizontal ribbons. This eliminates any direct through connection of framing members to maintain maximum insulating efficiency.



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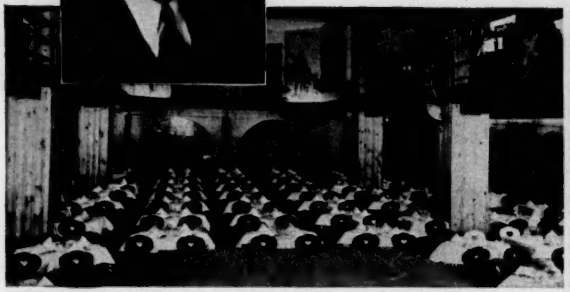

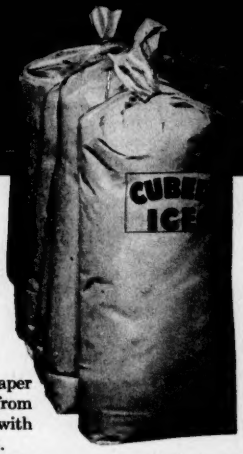

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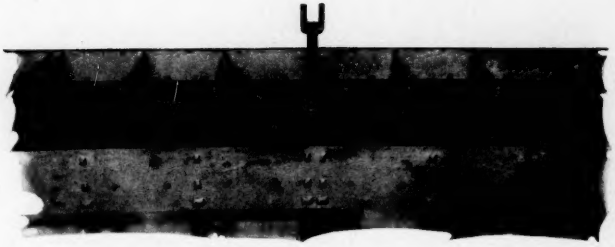

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In The Spotlight

AIR PURIFICATION in fruit storage rooms was the subject of an investigation by the Bureau of Plant Industry, U. S. Department of Agriculture at Wenatchee, Wash. Two of the more common methods of removing odorous emanations were analyzed and evaluated from the standpoint of storage life and quality. Details and methods of the study, and conclusions, are given in the full report which starts on page 17.

THE LARGEST artificial skating rink in the world was completed recently in Central Park, New York City. With sixteen miles of wrought iron pipe, it has capacity for 1,000 skaters. For description of the new rink, see page 26.

CONCRETE WORK on modern big dams requires refrigerating equipment for cooling the mix. For instance the Detroit Dam in the Cascade Mountains in Oregon will require one and a half million cubic yards of concrete. The cooling equipment is illustrated and described in article on page 27.

IF WE PAY AS WE GO—and don't cut spending—that $71 billion budget means $71 billion in taxes next year. Divide this by the number of families in the United States and you have a tax bill of $1,589 per family.

CENTRIFUGAL compressors have many advantages, especially in large tonnages including their use with extremely low temperature refrigerants and the fact that multi-staging and intercooling are easily accomplished. These and other advantages, as well as their characteristics, are discussed and illustrated in the article starting on page 37.

COVER: Site of Detroit Dam in Cascade Mountains, Oregon. At left is pile of crushed stone, and at right are storage bins, cooling equipment and mixers. Material for concrete is cooled with modern refrigerating equipment.

COLD STORAGE holdings for April 30 show cooler space 59 percent occupied and freezer space was 59 percent occupied. The complete monthly report is summarized in the article starting on page 29.

THE STORAGE TIME of Emperor and Almeria grapes is concluded from the May issue. This study, conducted by the Oregon Agricultural Experiment Station in cooperation with the Refrigeration Research Foundation, shows that certain treatments and combinations of treatments will lengthen the storage life. See page 31.

SABOTAGE in industrial plants is becoming an increasing possibility with the stepped-up war plans program. To combat the work of saboteurs the law enforcement agencies need the help of every plant worker. A program of guarding against sabotage with instructions to workers on what they can do is given in the article on page 35.

THE TECHNOLOGY of the frozen food industry has had a huge development within the last forty years and this is reflected in expanding new products, new processes, new equipment and new techniques. The subject was reviewed by E. H. Wiegand of the Food Technology Department, Oregon State College at the recent frozen food convention. See page 60.

A HANDSOME Iceman's picture occupies the center of interest in 3500 billboards to be displayed throughout June by the Gulf Oil Corporation. See story on page 47.

NEW MARKETS for ice was the subject of an interesting panel discussion at the California Ice convention, covering beer cooling, poultry cooling, and ice in fresh meat cases. This discussion which should be of interest to all ice distributors is summarized in the article starting on page 49.

FROZEN FOODS for members of the armed forces face greatly expanded use according to an officer of the Quartermaster Market Center System, speaking at the annual convention of the National Association of Frozen Food Packers. His address is published starting on page 56.

Woman Tells Repair Man How to Fix It

HER refrigerator door wouldn't close, so she called the service man. The service man, after considerable study, informed her that the door wouldn't close because the hinges were worn and as a result the door sagged. It is a heavy modern door. "You'll need a new pair of hinges," the service man informed her.

"Can't the hinges be repaired?" she asked.

"The cost of repairing would be more than the cost of a new pair of hinges," was the reply.

"Couldn't you just exchange these two hinges so that the bottom one would be at the top and the top one at the bottom?" queried the woman who knows nothing about machinery.

That was a new one to the service man. He hadn't thought of such a thing. Nobody else had ever thought of such a thing. On previous jobs he had always put on a new pair of hinges, but here was a woman who had an idea that was new to him.

"I believe it would work," the service man said finally. "Let's try it."

He switched the hinges in a few minutes and the door closed and opened perfectly. Then he complimented the woman who knows nothing about machinery.

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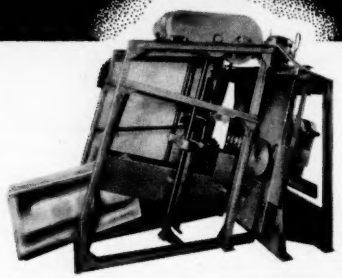

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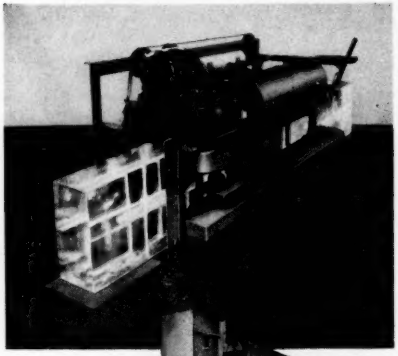

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6708

PURIFYING AIR IN STORAGE ROOMS

Investigation at Wenatchee, Wash., shows effects of air purification and its importance in storage of fruits. Two methods are analyzed and evaluated in this report

FISK GERHARDT*
G. F. SAINSBURY*

Refrigerated warehouse operators have stated that storers of fruit have been encouraged to demand installation of air purification equipment when there was little basis for belief that it would bring benefits commensurate with the cost. This investigation evaluated two methods of air purification and determined that neither had significant effect of extending the storage life, or increase market quality of five varieties of fruit. People who store apples and pears for themselves, or for others, will be interested in the report of this investigation. The authors of this article are recognized authorities on the subject.

CONSIDERABLE interest exists at present in the commercial use of activated coconut shell carbon for the removal of odorous emanations from fruit held in cold storage. Ethylene has been identified as one of the chief components of these volatiles (2,4,7,9,10). It is also recognized that at temperatures of 60 to 70 F. and higher normal ripening of some fruits may be hastened by the presence of this gas (8,12). Many other odorous volatiles, such as certain acids, aldehydes, alcohols, esters, and essential oils have also been identified in the emanations from apples and pears (3, 11).

Whether these materials may be detrimental to the cold storage life of the fruit has not been conclusively established, although work by Smock (12, 13) and by Smock and Southwick (15) has indicated benefits to storage life by a reduction in the volatile level of the storage atmosphere.

Work at Cornell University (13) has shown that brominated carbon effectively removes ethylene, but the practical difficulties of containing the corrosive brominated carbon in metal trays and canisters led to its abandonment as an adsorbent for fruit odors. Recent recommendations (15, 17) on air purification of fruit storages suggest the use of plain activated coconut-shell carbon for the removal of ethylene and other volatile emanations. Experimental installations based on these latter recommendations have been reported to add one to two months' storage life to Eastern grown apples (16).

Fidler (3), working in England, and Gerhardt (6), in Washington State, reported failure of activated carbon to remove ethylene effectively, although both reported good removal of other volatile compounds with this adsorbent. Neither of these workers was able to demonstrate a significant improvement in the storage life of apples, although some detectable benefit was noted in the storage conditions of early harvested Bartlett pears and some reduction in apple and pear scald.

Objects

Studies were initiated in the laboratories of the U. S. Department of Agriculture at Wenatchee, Wash., in 1948 to obtain information on methods of air purification and its importance in fruit storages. This is the second in a series of reports and in it equipment devised for using brominated charcoal is compared in efficiency of odor removal with commercially developed canisters of activated coconut-shell carbon.

The results of a survey of the amount of ethylene and non-ethylenic volatiles present in the normal air of commercial storages of varying sizes, systems of refrigeration, and commodity loads are also presented. The effect of air purification on the storage life, dessert quality, and physiology of pears and apples is also recorded in considerable detail.

Materials and Methods

Storage rooms. The three refrigerated rooms in which the experimental air purification studies were made comprised a portion of the regular cold storage space at the Wenatchee laboratory. These rooms were all operated at 31 F. and had similar insulation, air distribution, and type of refrigeration (Freon fin-coiled blowers). The air quantity and pattern of circulation were such that the velocity through the stacks was well in excess of 30 to 35 ft. per min., suggested by Smock et al. (14) to give ample movement of the volatiles away from the fruit. Room A (activated carbon) and B (brominated carbon) each had a volume of 760 cu. ft. Room C with 1728 cu. ft. of space served as the check or control room; it had no facilities for filtering the storage air.

Chemical analyses of storage room air were also made in a number of commercial apple storages in the Wenatchee Valley. Information on the characteristics of these rooms and their commodity loads are given in the text.

Source and Storage of Fruit. Five varieties of fruit were used in these experiments; each variety was harvested at what constituted an optimum commercial maturity from normal, individual trees in the Wenatchee Valley. Pickings were made as follows: Bartlett pears, August 22, at a pressure-test reading of 16.4 lbs.; Anjou pears, August 31, 11.8 lbs.; McIntosh apples, September 6, 13.8 lbs.; Red Delicious, September 20, 15 lbs.; Golden Delicious, October 5, 14.2 lbs.

The fruit, usually eight bushels of each variety, was thoroughly composited, wrapped in plain paper and packed in standard wooden 1-bushel apple boxes. All lots of fruit were then held at room temperature for two days, to simulate delay in commercial handling; they were then stored at 31 F. in experimental rooms A, B, and C.

Fruit of a similar quantity and kind was placed in the activated and brominated carbon rooms. In addition to the experimental fruit, rooms A and B also received 125 boxes of loose cull Delicious apples on September 29. The check room, C, carried miscellaneous amounts of apples and pears necessary to meet the

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NOTE: The engineering phases of this study were made under the Research and Marketing Act of 1946 (RM 413).

demands of other storage projects of the Station. This room received an unusual amount of ventilation as a result of heavy in and out traffic. Ethylene and a mixture of amyl alcohol, amyl valerianate, amyl acetate, and acetaldehyde were added to the storage air at irregular intervals in an effort to keep the volatile content of the atmosphere somewhat comparable with that found in normal commercial storages.

Absorption and Measurement of Volatiles. Ethylene and the total volatiles other than ethylene were collected in the absorption towers shown in Fig. 1. A measured amount of air (10 to 20 cu. ft.) was drawn through flowmeter No. 5 at the rate of 30 liters per hour and then through Truog tower No. 3 carrying 18 ml. of 95 percent H_2SO4 for the removal of total volatiles other than ethylene; it was next passed into 20 gms. of granular anhydrous magnesium perchlorate in tube No. 6, and finally through tower No. 4 containing 15 ml. of a 60 percent perchloric acid-mercuric oxide solution for the removal of ethylene. The absorbates in tower Nos. 3 and 4 were oxidized with ceric sulphate and ceric perchlorate respectively according to modifications of methods previously published (5, 6).

Ethylene is expressed as milligrams per cu. ft. of storage air and may be converted to parts per million (ppm) by multiplying by the factor 27.3; total volatiles other than ethylene are recorded as milligrams of ceric sulphate reduced per cu. ft. of air. It should be noted that all values given for the concentration of non-ethylenic volatiles are expressed only in terms of this arbitrary standard and that the data available at present cannot be converted to other units.

Analysis and Ripening of Test Fruit. Respiratory measurements for the five varieties of fruit in storages A, B, and C were made on the tared and aerated fruits by absorbing the respired CO_2 in Truog towers containing standardized barium hydroxide. Respiration is expressed as milligrams of CO_2 liberated per kilogram of fruit per hour. Firmness of the fruit was measured with a Magness-Taylor pressure tester.

The soluble pectin content of most fruits is commonly associated with its degree of ripeness; it is often used as an index to evaluate post harvest handling and storage procedures. Soluble pectins were determined in 100 gms. of clarified juice according to the method of Carré and Haynes (1) and are expressed as percent of calcium pectate in fresh juice.

The condition, ripening characteristics, and dessert quality of the various lots of experimental fruit in storages A, B, and C were also compared after ripening at 65 F. Thirty to forty fruits were used for the ripening studies after withdrawal from cold storage at irregular intervals.

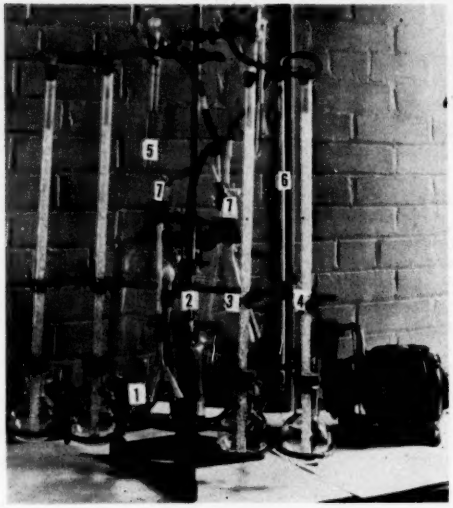

Fig. 1. A portable apparatus for the absorption of ethylene and non-ethylenic volatiles in metered quantities of air.

1. Air sampling intake; 2. Mercury trap pressure regulator; 3. Sulphuric acid tower for absorption of volatiles other than ethylene; 4. Perchloric acid tower for absorption of ethylene; 5. Flowmeter; 6. Magnesium perchlorate scrubber tube; 7. Surge chambers.

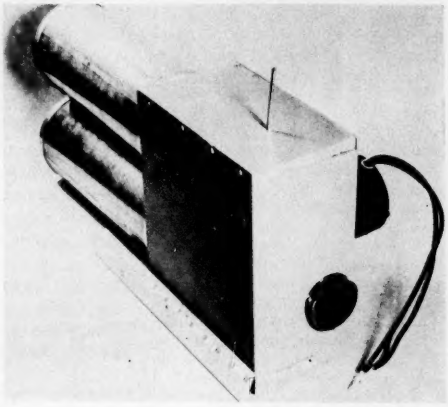

Fig. 2. Air purification unit used in room A, showing the two canisters that contain activated carbon and the air delivery opening from the enclosed fan.

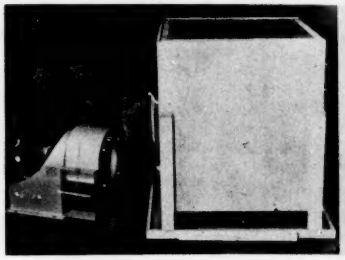

Fig. 3. Air purification unit used in room B, showing the motor driven fan and the cabinet with trays of brominated carbon and drip pan beneath.

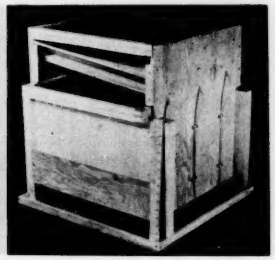

Fig. 4. Air purification unit upper panel removed for withdrawal of upper tray of brominated carbon. Drip gutter beneath upper tray also shown.

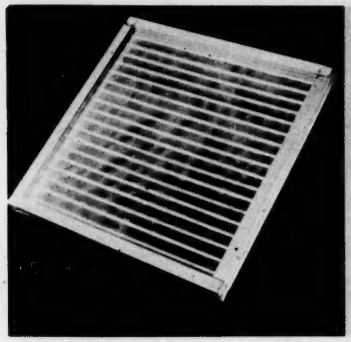

Fig. 5. Wooden framed tray and plastic screen for support of carbon.

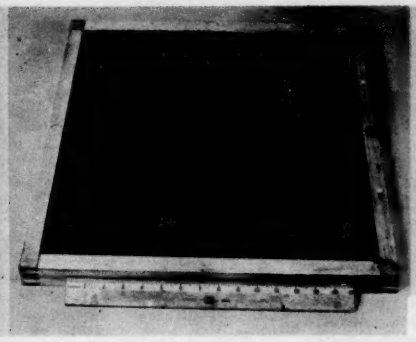

Fig. 6. One of the trays in the air purification unit filled with carbon.

Fig. 7. Air purification unit used in commercial storage rooms G and H (See Table II.)

Air Purification Equipment. The purification unit for experimental room A used activated carbon and was the same equipment employed last season. It consisted of two commercially built canisters containing a total of three pounds of activated coconut-shell carbon mounted on the rear of a casing that held a circulating fan (Fig. 2). Air was filtered through the canisters at the rate of 44 cu. ft. per min., which was equivalent to 3.5 air changes per hour in the room. This speed was only slightly in excess of that recommended by the manufacturer of the canisters.

The purification unit using brominated carbon was especially constructed to eliminate the corrosion difficulties encountered by previous workers who had used this type of carbon. Fig. 3 shows the assembly of this unit, which consisted essentially of the motor driven fan and the cabinet with the trays of carbon and the drip pan beneath. The outlet damper on the fan was adjusted to restrict circulation through the unit to 46 cu. ft. per min. comparable with that in room A. Air was drawn in at both the top and the bottom of the cabinet and passed through a ¾-inch deep bed of brominated carbon and then through a similar bed of plain activated carbon, to adsorb any possible fumes of bromine that might be present. Fig. 4 shows the purification unit with the upper panel removed for the withdrawal of the upper set of trays. The drip gutter beneath the upper brominated tray is shown. Fig. 5 shows the construction of the trays, which have square wooden frames, plastic screens and wooden dowel support rods beneath to keep the carbon bed level.

The cabinet and drip pan beneath the unit were constructed of plywood with wooden corner members and tray guides. The face area of the carbon bed on each tray was 2.3 sq. ft. and the average air velocity through the beds (10 ft. per min.) must be considered very low. The two trays each contained four pounds of activated carbon, while the brominated trays carried five pounds of material (1 lb. of bromine plus 4 lbs. of carbon). Fig. 6 shows a tray filled with carbon.

The brominated carbon used in these studies was prepared by treating activated coconut shell carbon

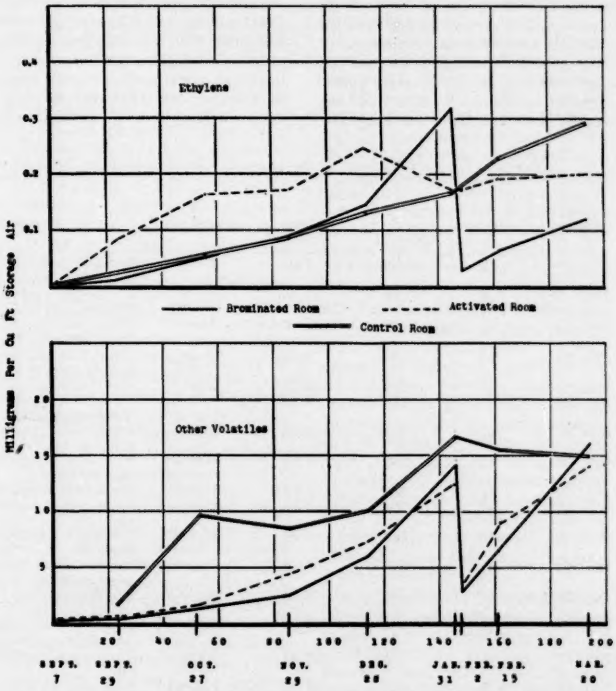

Fig. 8. The concentration of ethylene and other volatiles in the atmosphere of the experimental cold storage rooms as influenced by certain methods of air purification. Chart shows days and dates of air sampling 31 F.

TABLE I—ANALYSIS OF THE VOLATILE CONTENT OF THE INTAKE AND THE DELIVERY AIR OF THE CARBON UNITS AS A MEASURE OF THEIR OPERATING EFFECTIVENESS

Date Sampled	Period of Operation	Brominated Carbon Unit[1]				Activated Carbon Unit[1]			
		Ethylene[2]		Other Volatiles[3]		Ethylene[2]		Other Volatiles[3]	
		Intake	Delivery	Intake	Delivery	Intake	Delivery	Intake	Delivery
	Days								
Nov. 29	92	0.088	0.050	2.54	1.36	0.165	0.165	4.23	3.16
Jan. 31	155	.321	.321	14.10	14.10	.177	.184	12.40	12.10
Feb. 2[4]	1	.029	.029	3.10	1.50	.170	.127	3.57	2.29
Mar. 23	51	.127	.137	16.30	16.30	.200	.200	14.20	14.00

[1] Brominated unit carried 16 lbs. of carbon. Activated unit carried 3.0 lbs. of carbon. 150 boxes of fruit in each room. Air circulation through both units was similar (3.5 air changes per person per hour).
[2] Ethylene expressed as mgs. per cu. ft. of storage air.
[3] In terms of mgs. of $Ce(SO_4)_2$ reduced per cu. ft. of storage air.
[4] Both units were recharged with fresh carbon on Feb. 1 and sampled after operation for 24 hours on their respective storages. No other special means were employed to lower the volatile concentration.

with 20 percent by weight of C.P. bromine. Because heat was evolved in the process, only small amounts of the brominated product were prepared at a time; the material was then aerated for a short period (2 hours) to insure the removal of any free bromine.

The purification unit used in commercial storage rooms G and H (later) (See Table II) was a special self-contained commercial unit (Fig. 7) designed for use in a room of 20,000 box capacity. Air was circulated through the unit by a 1/3 hp. propellor fan at a rate of 2,500 cu. ft. per min. The air passed first through 24 filter screens containing a total of 168 pounds of "Adsordite" carbon and then over a high pressure quartz mercury arc lamp for ultra violet radiation (arc and input not known).

Results

Volatiles in Experimental Rooms During Air Purification. Analyses of the air for ethylene and other volatiles in the activated carbon, brominated carbon, and control rooms were made at various intervals during the storage season. Initial determinations were made September 7 and final analyses were made March 20, covering a storage period of 194 days. The concentrations of these volatile fractions in the various rooms are shown in Fig. 8.

The curves in this figure show that from the beginning of storage until December 28, the ethylene in the brominated carbon room was maintained at a substantially lower level than in the activated carbon room. Between December 28 and January 31 the adsorbtive capacity of the brominated unit was finally exhausted and the ethylene concentration rose to its highest level 0.321 mgs. per cu. ft. of air, which is equivalent to 8.8 ppm.

On February 1 the carbon in the brominated unit was replaced with a fresh charge and new canisters were placed in the activated unit. Analyses of February 2 indicated that after 24 hours of operation the ethylene level in the brominated room had dropped to about 10 percent of its former value, while the level in the activated carbon room had changed very little. Following replenishment with fresh carbon, the ethylene level in the brominated carbon room gradually increased, but at a materially lower level than that in the activated carbon room. The higher ethylene

TABLE II—VOLATILE LEVEL IN THE AIR OF A MISCELLANEOUS GROUP OF COMMERCIAL FRUIT STORAGE ROOMS

Date Sampled	Room	Volatiles[1]		Air Treatment	Room Characteristics and Commodity Load
		Ethylene	Other Volatiles		
Sept. 25	A	0.139	1.95	None	Forced-air, 2 unit coolers, 78 car[2] cap., ½ full Bartlett pears, green fruit, slight odor.
Feb. 9	B	.198	11.44	None	Forced-air, central system, 65 car cap., approx. full packed Winesap and few Delicious apples.
Feb. 13	C	.365	11.00	None	Forced-air, central system, 88 car cap., approx. ⅗ full loose Delicious, some Winesap apples.
Feb. 14	D	.433	9.28	None	Piped coils, 27 car cap., about ⅔ full packed Winesap apples, basement room.
Feb. 16	E	.295	12.28	None	Piped coils, 33 car cap., full of tray packed Winesap apples.
Feb. 23	F	.183	9.67	None	Forced-air, 3 unit coolers, 40 car cap., about ¾ full packed Winesap apples.
Sept. 16	G	.095	0.86	None	Piped coils, 18 car cap., ⅔ full loose Bartlett pears, very green color, no odor.
Oct. 6	G	.050	1.30	Filtered[3]	Four days following removal of Bartlett pears, 2 cars of Delicious apples in room.
Oct. 20	G	.200	2.02	Filtered	Room full of packed Delicious apples on October 15.
Nov. 18	G	.400	4.80	Filtered	Room full of packed Delicious apples, increase in storage temp. to 34–36° F.
Nov. 19	G	.342	2.60	Filtered	Discharge air direct from unit as compared with room air on Nov. 18.
Dec. 13	G	.344	5.60	Filtered	Almost full of packed Delicious apples, considerable in and out hand trucking.
Jan. 22	G	.400	7.60	Filtered	Slightly less than ½ full Delicious apples, no fruit odor, room empty Feb. 12.
Feb. 15	H	.274	18.30	None	Piped coils, 25 car cap., ¾ full packed Delicious apples, minimum in and out trucking.
Feb. 21	H	.246	13.70	Filtered[3]	Carbon unit in operation for 6 days prior to sampling of storage air.
Feb. 27	H	.243	12.80	Filtered	Discharge air direct from unit as compared with room air on Feb. 21.
Mar. 28	H	.091	10.30	Filtered	Room nearly empty, 3 cars packed Delicious apples in storage.

[1] Ethylene expressed as mgs. per cu. ft. air. Other volatiles as mgs. of $Ce(SO_4)_2$ reduced per cu. ft. of air.
[2] 798 packed boxes per carload.
[3] Activated carbon unit. (See description in text.)

content of the air in the activated carbon room as compared with that in the control room during the first part of the storage period may be due to the good ventilation received by the latter.

The brominated and activated units were fairly similar in their removal of non-ethylenic volatiles from the storage air, and such variations as did exist may be explained by the difference in carbon quantities in the two units and in the ventilation characteristics of the two storage spaces. When the carbon in each unit was renewed on February 1, the analyses of the storage air in each room on the following day showed a sharp reduction in the level of non-ethylenic volatiles. By the end of the storage period, however, these volatile fractions had regained concentrations similar to those existent just prior to the renewal of the carbon. This increase in volatile level indicated that the carbon had again reached its limit of adsorbtive capacity in about 6½ weeks, whereas the initial charge earlier in the storage season required about three times as long to reach saturation.

To gauge the effectiveness of the carbon in adsorbing these various fractions, some analyses were made of the air directly after it had passed through the carbon and before it had mixed with room air. The efficiency of the unit was indicated by the difference in concentration of the volatile fractions before and after passage through the carbon. Table I presents the results of these analyses.

The data for November 29 show that the brominated unit substantially reduced the amount of both ethylene and other volatiles. The activated unit reduced the level of non-ethylenic volatiles but failed to remove ethylene. By January 31 neither unit made any significant change in the concentration of either volatile fraction. Twenty-four hours after the carbon was replaced on February 1, the activated carbon unit made a slight reduction in the ethylene level and substantially lowered the non-ethylenic volatiles in the discharge air.

The brominated carbon unit after being recharged greatly reduced the amount of both types of volatiles. The reduction in ethylene level during the initial period of operation was so great (from 0.321 mgs. per cu. ft. on January 31 to 0.029 mgs. on February 2) that apparently the concentration of ethylene in the room was in equilibrium with the adsorbtive power of the bed and no further measurable reduction in the level was made as the air passed through the unit. By March 23 the concentration of ethylene was high and non-ethylenic volatiles in the room had increased to a point higher than on January 31. Neither air purification unit made a substantial reduction in the concentration of either fraction of volatiles as the air passed through the carbon.

Because there is a substantial evolution of volatiles by the fruit during storage, their adsorption at a rate sufficient to maintain a low level requires a measurable reduction in their concentration each time the air passes thrcugh the carbon. The ethylene evolved per cubic foot of air circulated can be calculated by the following formula:

$$\frac{\text{No. boxes x lbs. per box x rate of production of ethylene}}{\text{lbs. per kg x rate of air movement x minutes per day}} = \text{mgs. of ethylene per cu. ft. of air circulated in the storage room.}$$

For example, in room B, with 150 boxes of apples (40 lbs. per box) if it is assumed that ethylene was produced at the rate of 0.3 mg/kg/24 hours,[1] and the air circulated through the unit at the rate of 46 cu. ft. per min. the calculations would be as follows:

$$\frac{150 \times 40 \times 0.3}{2.2 \times 46 \times 1440} = 0.012 \text{ mgs/ cu. ft. of air}$$

The value 0.012 mg/cu. ft. of air is within the limits that can be determined by the ethylene method used.

A calculation similar to the foregoing can be applied to non-ethylenic volatiles by using a production rate of 15 mg. of $Ce(SO_4)_2$ reduced /kg. of fruit /24 hours.[1]

The data in Table I shows that when the units were active the volatile products in the air passing through were adsorbed more rapidly than the calculated rates of volatile emanation. The bulk of fruit in these rooms was overripe cull Delicious whose rate of emanation could be expected to be substantially greater than that of commercial fruit.

The foregoing calculations do not take into account the lowering of concentrations of volatiles by diffusion through the storage room walls and the effect of ventilation due to opening doors and air leakage into the room. Since the loss of ethylene due to diffusion is proportional to the differences in vapor pressure and the vapor pressure of ethylene at the highest concentration measured (January 31) was only 0.007 mm. of mercury it appears doubtful that this can be a significant factor.

The fact leads to the conclusion that under certain conditions ventilation can be of considerable importance. When the purification units were saturated (January 31), the entire volatile production in the rooms was being dissipated largely by ventilation. This can be demonstrated by considering the fact that in the storage room atmosphere if 500 cu. ft. of net air space was figured (260 cu. ft. for actual displacement of fruit, boxes, and equipment) there were 92 and 160 mgs. of ethylene in the activated and the brominated room respectively, on January 31. (Table I, respective ethylene concentrations 0.184 and 0.321 mg. per cubic ft.) However, from the information available on production rate of ethylene and from the amount of fruit in the room, it was calculated that the production of ethylene was approximately 820 mg/24 hours in each room. To maintain the concentrations observed would require ventilation at a rate of about nine and five air changes per day, respectively, for the activated and brominated rooms. This rate of air turnover is not unusual for small rooms.

As volatile concentration in the room is lowered the effectiveness of ventilation decreases. For instance, in the brominated room, five air changes per day on January 31 would have been sufficient to balance the ethylene production at a room concentration of 0.321 mg/cu. ft., but on February 2, when the concentration of ethylene had dropped to 0.029 mg/cu. ft. the same amount of ventilation would have disposed of only nine percent of the daily production.

The foregoing calculations were based on the assumption that the rate of evolution of ethylene and volatiles remains constant. Fidler (3) suggested that these rates vary with the concentration, the higher concentrations inhibiting production. Sufficient quantitative data are not yet available to determine whether this variation is significant at the levels encountered in normal air storage. However, if such is the case, the foregoing type of analysis can still be used by taking into account the variability in production rate at the concentrations encountered.

In comparing the volatile levels in the various rooms, the effect of ventilation as a subsidiary agent in air purification must be borne in mind. The activated carbon room formed an entrance vestibule for the brominated carbon rooms and it is therefore reasonable to assume that air losses from the brominated carbon room due to door opening were less

[1]These values are average rates obtained in recent determinations on apples at 31 F. made at the Wenatchee station.

than those from the activated carbon room. The control room, which also opened directly into the outside hallway, served as a general storage room at the Station and consequently was subjected to much more traffic than rooms A and B. To offset this condition, supplementary amounts of volatiles were added as previously described. A study of the atmosphere in the control room showed a concentration of non-ethylenic volatiles equivalent to 10 to 16 mg. of $Ce(SO_4)_2$ reduced per cu. ft. This value is within the average range observed last season in commercial storages and in similar tests this season as summarized in Table II. On the other hand, the ethylene concentration so attained was not comparable with normal commercial levels until late in the season. Earlier in the season the ventilation in the control room was as effective in removing the ethylene as was the brominated carbon unit, in the less well ventilated room B.

Another condition shown in Fig. 8 may also be attributed to the effects of ventilation. For instance, the level of non-ethylenic volatiles in the brominated room was generally slightly lower than in the activated room. In view of the difference in amount of carbon used in the two units, it would be reasonable to expect some such effect. There are two points on the chart where the levels in the brominated room are higher than in the activated room. These points (Table I) occurred at the times when the adsorptive capacities of the units were exhausted and the volatile levels in the rooms were really being controlled by the ventilation resulting from air leakage and opening of the door.

The thought has been expressed that the passage of air through flat trays of carbon is inherently an inefficient arrangement because of the tendency of the air to create channeling of the carbon and the subsequent by-passing of large quantities of unfiltered air. In designing the brominated carbon unit, low air velocity through the trays (approximately 10 fpm.) was used in an attempt to minimize this channeling. When the second charge of carbon became saturated in about 6½ weeks, the following experiment was tried to detect whether channeling and by-passing had occurred. The trays were removed from the purification unit and the carbon was thoroughly mixed, releveled, and replaced in the unit. An analysis of the air entering and leaving the unit, after this mixing failed to show a revival of adsorptive power such as might be expected if considerable amounts of unsaturated carbon remained. In other words, no channeling of air had taken place.

Readings were taken during the season of the pressure drop due to the resistance of air passage through the activated and brominated units. These observations did not show any significant changes in air impedence, the resistance through the activated and brominated units remaining equivalent to static pressures of approximately 0.14 and 0.10 inch of water throughout the season. Inspection of the brominated carbon beds showed no visible liquefaction of bromine derivatives and the carbon retained its original free-flowing characteristics.

The observations from the foregoing tests showed that a satisfactory brominated carbon unit could be constructed and such a unit would produce a reduction in the ethylene concentration, whereas an activated carbon unit did not give an appreciable reduction. Both units produced a reduction in the level of non-ethylenic volatiles. Neither unit was capable of operating an entire season without recharging with carbon.

Volatiles in Commercial Fruit Storage Rooms. In working with volumes of air as in ventilation or air purification studies, the engineer is interested in the atmospheric concentration of the volatiles to be removed. In the case of fruit storages he must know what level of volatiles to anticipate in such structures when they are operated under normal commercial conditions. Data of this nature are very limited.

With the newer analytical methods at hand, it was possible to obtain some information on the concentration of ethylene and other volatiles in a number of commercial fruit storages in the vicinity of Wenatchee, Washington. These data, together with the kind of refrigeration, air distribution, size, and commodity load of the various rooms, are assembled in Table II.

Contrary to general expectation, ethylene and other volatiles were present in relatively small quantities in the atmosphere of well-operated Bartlett pear storages. (See rooms A and G, Table II.) Quantitative work[2] on the emanation of volatiles from known weights of fruit indicate that Bartlett and Anjou pears at cold storage temperature emanate much smaller quantities of volatiles than do apples. It is only as pears soften and approach dessert condition that they liberate large amounts of ethylene and other volatiles. Fruit condition in room G was distinctly superior to that in room A, and this difference was likewise reflected in a lower concentration of ethylene and odorous emanations in the former room.

Data in Table II show that the ethylene content of the air in the different storage rooms in February when they were generally well filled with fruit, varied from approximately 0.2 to 0.4 milligrams (5.5 to 11 ppm.) and the other volatiles equivalent to about 9 to 18 milligrams of $Ce(So_4)_2$ reduced per cubic foot of storage air, respectively.

Apparently there is no direct relation between the ratio of ethylene to non-ethylenic volatiles as they exist in the various commercial storages. For instance rooms D and E (Table II) were very similar in refrigeration and commodity loads, yet room D carried a much higher ratio of ethylene to other volatiles than did room E. A similar situation with regard to the presence of these volatiles was also encountered in a comparison of rooms D and H. These studies do not attempt to explain the underlying reason for such differences in the ratio of volatiles in the storage air; they do demonstrate, however, the existence of such a variance in commercial practice.

An opportunity was presented to measure the concentration of volatiles in a commercial fruit storage equipped with the portable air purification unit shown in Fig. 7. The ultraviolet radiation supplied by the mercury arc lamp in this unit was intended to polymerize the ethylene by photosensitization and thereby facilitate its adsorption by activated carbon. It was originally planned to operate this unit continuously from October to March in room G (Table II) filled with Delicious apples. Commercial receiving and shipping operations, however, altered these plans since the room actually received much in and out traffic of packed fruit and held no stored fruit after February 12.

Some data relative to the volatile levels in room G are shown in Table II. In comparison with other commercial rooms without air purification, the unit did not lower the ethylene content of the storage air; it did, however, reduce the concentration of non-ethylenic or odorous volatiles. Analyses of the intake and discharge air of the unit made on November 18 and 19 show that the apparatus was much more efficient in the removal of odorous volatiles than in the removal of ethylene.

With discontinuance of room G because of lack of fruit, the air puri-

[2]Data obtained this current season at the Wenatchee Station.

TABLE III—RESPONSE OF PEARS TO AIR PURIFICATION DURING STORAGE AT 31 F.

Date Sampled	Length of Storage	Soluble Pectin			Firmness (pressure-test reading)		
		Check	Activated Carbon	Brominated Carbon	Check	Activated Carbon	Brominated Carbon
	Days	%	%	%	lbs.	lbs.	lbs.
				Bartlett Pears[1]			
Sept. 23	32	0.045	0.043	0.040	14.2	14.1	14.9
Oct. 4	43	.045	.045	.039	14.1	14.5	14.6
Oct. 28	67	.055	.069	.068	13.6	14.6	14.9
Nov. 28	98	.092	.099	.101	13.6	13.6	13.0
Jan. 11	142	.162	.169	.166	10.8	11.6	11.5
				Anjou Pears[2]			
Dec. 8	99	0.062	0.058	0.055	11.2	11.4	11.3
Jan. 27	149	.076	.080	.093	7.9	8.3	8.6
Apr. 3	215	.152	.160	.149	6.9	6.4	7.1

[1] Harvested on August 22 at a pressure test reading of 16.4 lbs., with 0.045 percent soluble pectin.
[2] Harvested on August 31 at a pressure test reading of 11.8 lbs., with 0.062 percent soluble pectin.

fication unit was moved to room H (Table II) on February 15. The contents of ethylene and other volatiles in this space just prior to operation of the unit were 0.274 and 18.30 mgs. per cu. ft. of air respectively and after six days of operation 0.246 and 13.70 mgs., respectively. Thus, the odorous volatiles in this room were reduced more than was the ethylene fraction. A comparison of the volatile levels of the intake and discharge air of the unit as made on February 21 and 27 suggests that the carbon filters may have approached the limit of their adsorptive capacity.

Cold Storage Response of Test Fruit to Air Purification. In studying the influence of air purification on the storage life and quality of the experimental fruit, measurements were made of the firmness and soluble pectin content of each variety. Observations were also made of the appearance and condition of the fruit at the time of removal from cold storage. Data in Tables III and IV show that air purification in the experimental storage rooms did not alter the keeping quality of the fruit at 31 F. as measured by changes in the firmness and pectin content of the tissue.

The respiration values for the various lots of fruit in cold storage are presented in Fig. 9. Air purification by either brominated or activated carbon did not alter the respiratory intensity of the apple varieties from that of comparable fruit in normal air. Bartlett pears, and to a lesser degree Anjou pears, however, in the air-purified storages respired at a somewhat faster rate than in the control room. Since temperatures were very similar in all rooms, it is difficult to suggest a reason for the greater respiratory intensity of pears stored in purified air. Such differences were not encountered in last season's work when similar varieties of pears were stored in activated carbon rooms.

It was impossible to distinguish any difference in the condition or appearance of the test fruit in the various storage rooms that could be correlated with the presence or absence of air purification. Bartlett and Anjou fruits were free from pear scald in all cold storage rooms. These varieties evidenced some shrivel late in their storage season, but gave no indication of change in color or condition that could be correlated with air purification. Red Delicious apples were the only variety affected with common scald in cold storage; this disorder appeared late (April) in the season and was of approximately similar intensity regardless of the type of air purification employed.

Ripening of Test Fruit as Influenced By Air Purified Storage

Bartlett Pears. Samples of Bartlett pears were removed from experimental storages A, B, and C and ripened at 65 F. on September 23, October 4 and 28, November 28, and January 11. All lots of fruit removed in September became full yellow in color and of prime dessert quality after ripening for five days. The pears were juicy and full flavored, and there was no difference in condition that could be correlated with

TABLE IV—RESPONSE OF APPLES TO AIR PURIFICATION DURING STORAGE AT 31 F.

Date Sampled	Length of Storage	Soluble Pectin			Firmness (Pressure Test Reading)					
					Check		Activated Carbon		Brominated Carbon	
		Check	Activated Carbon	Brominated Carbon	31°	65°[1]	31°	65°[1]	31°	65°[1]
	Days	%	%	%	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
					McIntosh Apples[2]					
Dec. 5	90	0.146	0.156	0.158	10.2	8.9	10.1	9.3	10.2	9.0
Jan. 27	143	.129	.151	.140	8.7	8.1	8.6	8.9	8.8	8.8
Apr. 3	209	.166	.200	.189	10.0	8.7	9.4	9.5	9.4	9.4
					Golden Delicious Apples[3]					
Dec. 16	72	0.095	0.076	0.072	13.3	9.7	12.3	9.5	12.2	9.9
Jan. 27	114	.090	.064	.063	9.7	10.7	10.4	11.3	10.0	10.9
Apr. 10	187	.109	.101	.101	10.7	10.0	10.7	10.5	10.4	10.3
					Red Delicious Apples[4]					
Dec. 14	85	0.049	0.059	0.055	13.5	10.1	13.0	10.2	13.2	10.0
Jan. 27	129	.048	.055	.054	11.2	12.2	11.3	11.4	11.6	11.5
Apr. 11	203	.075	.069	.072	11.8	10.5	12.3	10.9	11.5	10.4

[1] Tested after ripening at 65 F. for four days.
[2] Harvested Sept. 6 at a pressure test reading 13.8 lbs., with 0.039 percent soluble pectin.
[3] Harvested Oct. 5 at a pressure test reading of 14.2 lbs., with 0.042 percent soluble pectin.
[4] Harvested Sept. 20 at a pressure test reading of 15.0 lbs., with 0.046 percent soluble pectin

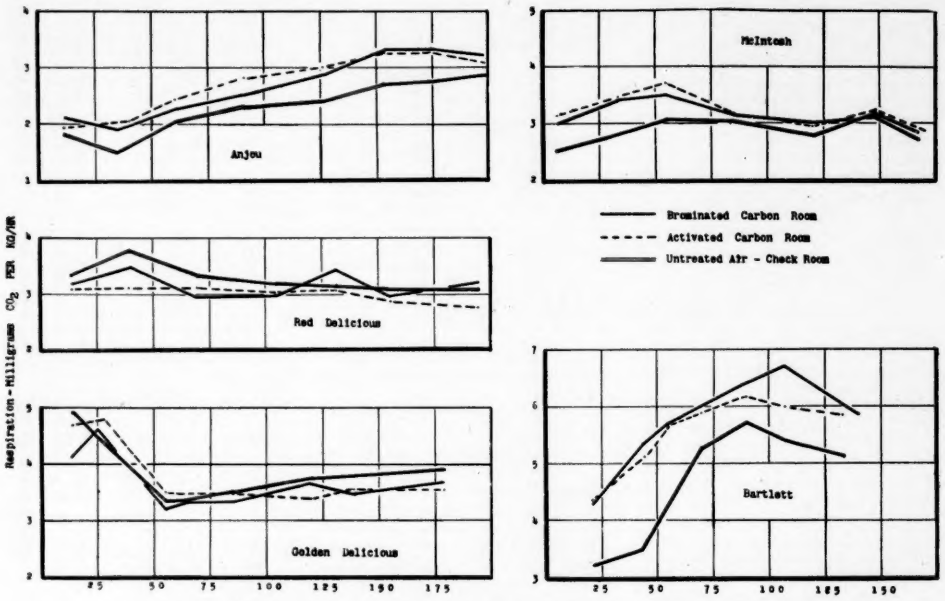

Fig. 9. Respiration of apples and pears at 31 F. as influenced by air purification with activated and brominated coconut shell carbon. Chart shows days in storage at 31 F.

the presence or absence of air purification during previous cold storage. The fruit was of excellent dessert quality on the seventh day of ripening but by the tenth day had become mealy and overripe. Fruit from the check and activated carbon rooms was somewhat more overripe than that from the brominated air storage. On the tenth day of ripening core breakdown affected 67, 23, and 80 percent, respectively, of the fruit in the activated, brominated, and check lots.

After withdrawal for ripening on October 4, all lots were almost eating ripe in four days. The brominated carbon stored fruit evidenced slightly more greenish ground color than did the other two lots. All fruits were in prime dessert condition in six days and showed no detectable difference in flavor or condition that could be correlated with air purification. After eight days of ripening, the check and activated carbon stored lots were distinctly overripe, while the fruit stored with brominated carbon possessed fair dessert quality. The percentages of fruit affected with core breakdown in the three samples on the eighth day of ripening were as follows: activated carbon 50, brominated carbon 29 and the check lot 61 per cent.

All samples of fruit removed for ripening on October 28 were full yellow and of optimum dessert quality in four days. None of the fruit ripened with normal characteristic juicy texture; it was granular and of inferior flavor. At six days, all lots were mealy and overripe with the following percentage of pears with core breakdown: activated carbon 45, brominated carbon 35 and the control samples 30.

Fruit withdrawn for ripening on November 28 and January 11 demonstrated that filtering storage room air through activated or brominated carbon did not prolong the period over which Bartlett pears could be ripened with normal texture and flavor. All lots of fruit softened somewhat but developed core breakdown without evidence of attainment of acceptable dessert quality. The degree of scald and core breakdown was always less in fruit ripened after storage in the activated and brominated carbon rooms than in the checks. Bartlett pears from the brominated carbon room always developed less scald and core breakdown than those from the activated carbon room.

The above results substantiate the observations of last year, namely, that there may be some benefit to early harvested Bartlett pears by storage in carbon filtered air, especially in the reduction of scald and core breakdown as the ripened fruit passed through its stage of optimum dessert quality. Likewise, the current studies indicate that although air purification with brominated carbon did reduce pear scald, it failed to produce differences in condition, storage life or ripening capacity sufficient to be of commercial significance.

Anjou Pears. Anjou pears were withdrawn from the carbon purified and check rooms and ripened on December 8, January 27, and April 3. All fruits in the first withdrawals ripened to excellent dessert quality in seven days without detectable differences in texture and flavor. Anjou scald was, however, very severe on fruits from the check room and somewhat less prevalent on those from the activated carbon room and only a trace of it showed on fruits stored in an atmosphere of brominated carbon. The ripened fruit from all three storages was still of excellent dessert quality after 11 days at 65 F.; after 18 days all lots were mealy, overripe and of poor dessert quality. Fruit from the brominated carbon room at this time, however, evidenced the least deterioration in dessert quality.

All lots of pears withdrawn from storage on January 27 were soft but not eating ripe in four days; Anjou scald was again slight on fruit from brominated carbon storage and severe on fruit stored in unfiltered air. All lots were of optimum dessert quality after seven days of ripening. All fruits lacked normal juiciness, were slightly granular, and rated only fair in texture. After ten days the samples of fruit were mealy and after 14 days an occasional instance of core breakdown was detected. Dessert quality after 10 and 14 days of ripening was not influenced by air purification during cold storage.

When stored until April 3, all samples of Anjou pears failed to ripen normally. After four days at 65 F., they had softened but were very granular in texture and evidenced little change in dessert quality in seven days. On the eleventh day, all fruits were mealy and of very poor dessert quality.

Except for a reduction in scald, air purification did not influence, to any detectable degree, the storage life or ripening capacity of Anjou pears after withdrawal from storage in December.

McIntosh Apples. Samples of McIntosh apples were removed from the various air storages and ripened on December 5, January 27, and April 3. There was no evidence from the ripening characteristics of the December withdrawals to indicate any benefit from previous storage in purified air. All three lots of fruit were full flavored and yielding to mealy in four days at 65 F. They were still of good flavor but rather mealy after ten days and had developed no scald or breakdown after 25 days.

When comparable samples were ripened for four days in January severe scald developed in the fruit from the check storage and only slight amounts of this disorder in that from either the activated or the brominated carbon atmosphere. All lots were mealy but full-flavored after 7 days and even after 14 days had developed no breakdown.

By April all samples of McIntosh apples had developed some internal browning at 31 F. Both the check and the activated carbon stored apples had developed much more storage scald than had those from the brominated carbon room. All samples were mealy and lacked varietal flavor upon withdrawal from cold storage. It was not possible to detect any improvement in texture, flavor, or preservation of dessert quality as a result of storage in carbon purified atmosphere.

Golden Delicious and Red Delicious Apples. Samples of Golden Delicious apples were removed from the experimental storages on December 16, January 27, and April 10. Those of Red Delicious were removed on December 14, January 27 and April 11.

The Golden Delicious apples harvested at a late midseason maturity and with a light cream color did not scald and evidenced only a slight amount of shrivel. At the first two withdrawals, all lots were crisp and full flavored after four days of ripening, and maintained an excellent dessert condition for 10 days at 65 F.; after 20 days, texture had become somewhat mealy but there was no evidence of breakdown. By April all samples were yielding in texture and golden in color upon removal from 31 F. When ripened for seven days, all lots were slightly shriveled and slightly tough in texture. Flavor was good. In none of the samplings was it possible to distinguish any differences in ripening that could be attributed to storage in either activated or brominated carbon purified air.

Red Delicious fruits in December were crisp, juicy, and of excellent quality after ripening for four days; after 11 days, all lots had become yielding to mealy but there was no evidence of scald or breakdown. All samples were very mealy and somewhat stale in taste after ripening for 19 days at 65 F. There was no benefit to texture or flavor or prolongation of acceptable dessert quality as a result of previous storage in carbon filtered air.

Apple scald developed on the ripened fruits from the January and April withdrawals. It was present in distinctly less amounts on fruit from the air purified storages than on that from the check room. Activated carbon was possibly slightly less effective than the brominated type in the control of apple scald.

Fidler (3) reported that brominated carbon showed better control of scald than activated carbon, although in his work there was less advantage for activated carbon over the checks than observed here and a more substantial difference between activated and brominated carbon treated lots. He also reported air purification with brominated carbon to be less effective than the use of oil wraps in the control of scald.

When ripened in January and April, all lots of apples were yielding in texture and full-flavored after seven days at 65 F. They were mealy and stale in January after 20 days of ripening and in April after ripening for ten days. In the last case internal breakdown also was common. Other than by a reduction in apple scald, air purification did not prolong the storage life or enhance the ripening and dessert qualities of Red Delicious apples.

Summary and Conclusions

It was possible to use brominated carbon (20 percent bromine by weight) in an air purification unit without impedence of air movement through the carbon, impairment of equipment, or injury to the fruit. Brominated carbon was a more efficient adsorbent of ethylene than was activated carbon; both kinds of carbon, however, were effective for the removal of volatiles other than ethylene. The adsorptive capacity of both carbons was reached after about 120 to 140 days of continuous exposure to air in fruit storage.

No definite ratio of ethylene to non-ethylenic volatiles was found to exist in the air in regular commercial fruit storages during normal operation. Ethylene was present in amounts of 0.2 to 0.4 mgs. and other volatiles in amounts of 9 to 18 mgs. of $Ce(So_4)_2$ reduced per cu ft of storage air in February when storage rooms were well filled. A commercial air purification unit operated in a commercial storage functioned in a manner similar to the experimental activated carbon unit under test conditions.

It was not possible to detect or measure any significant improvement in rate of softening, ripening capacity, or dessert quality of pears and apples stored in air purified by passage through either activated or brominated carbon. The intensity of storage scald was reduced by air purification, and in fully ripened pears the onset of core breakdown was somewhat retarded.

Where storage scald is anticipated and oiled paper is not used, air purification of fruit storages with activated or brominated carbon can be of commercial importance. The level of fruity odors is also reduced by air purification with carbon.

Storage scald, however, is controlled more effectively and economically with oiled fruit wraps than by air purification. When fruit is protected with oiled paper, air purification by activated or brominated carbon did not significantly improve the commercial value of such fruit.

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New Outdoor Skating Rink in New York Has Capacity for 1,000 Skaters

NEW Yorkers, who like to do things in a big way, now have what is described as the largest artificial skating rink in the world. It was completed recently under the supervision of the city's Department of Parks, Robert Moses, Commissioner.

Located in Central Park, the giant Wollman Memorial Rink contains 16 miles of 1¼ in. wrought iron pipe embedded in an expanse of heavily reinforced 6 in. concrete that covers almost three-fourths of an acre. Its construction was made possible by a grant of $600,000 from Miss Kate Wollman, given in memory of her parents and brothers. The city accepted the gift and added $200,000 of city funds to tie the facility into the surrounding landscape and walks.

The new facility will provide a full winter of skating, from November 1 to March 31, a total of 151 days.

Adjacent to the rink is a completely equipped playground. In summer the surface will be "defrosted" to permit roller skating.

A semicircular building at the northerly end of the rink houses refrigeration equipment, a small restaurant and other facilities.

Located in Central Park, New York's Wollman Memorial Rink is the largest artificial outdoor ice skating rink in the world. It will be "defrosted" in summer to provide roller skating.

Machinery and Equipment

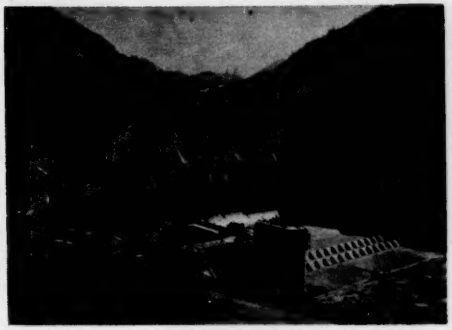
Refrigeration for the rink is furnished by three vertical single acting two-cylinder York ammonia compressors each rated at 120 tons capacity, driven by three 200 hp synchronous motors direct connected.

Other machinery and equipment consists of the following: three motor generator sets and three reduced voltage starters; three shell and tube condensers having a total capacity of 360 tons; two shell and tube brine coolers having a total capacity of 360 tons; one 5 hp ammonia pump out compress; one brine tank 9 ft diameter by 10 ft high; three centrifugal brine circulating pumps having a total capacity of 1900 gals per min; two condenser water pumps to circulate water from adjacent lake to condensers; one air and brine suction pump for purging piping in rink.

This photograph proves that 1¼ inch extra heavy wrought iron pipe can be turned on four-inch centers. Sixteen miles of the pipe were used on New York's Wollman Memorial Rink. York Corporation did the installation.

Modern Refrigerating Machinery Used to Cool Concrete Mix for Building Big Dam

View from upstream face of dam shows how pouring operations proceed in sections of the structure. From the overhead cable the concrete bucket is being lowered to the space in the center foreground. The thickness of the dam is apparent.



The downstream face and plant structure begin to take shape in this photograph. The baffles, lower right, reduce the run-off velocity. Concrete mixing equipment is at upper right on elevations that emphasize the rugged contour of the site.

THE Grand Coulee and Bonneville Dams, on the Columbia River, have attracted so much attention that people hardly realize that many other large power and irrigation projects are being built in the Pacific Northwest. The Detroit Dam is west of a town by that name on the Santiam River, about 85 miles south of Portland. Here a gorge in the Cascade Mountains makes it possible to construct a dam 450 ft. high in a width of only 1580 feet. The water will back up 8½ miles and will form a lake covering 4000 acres.

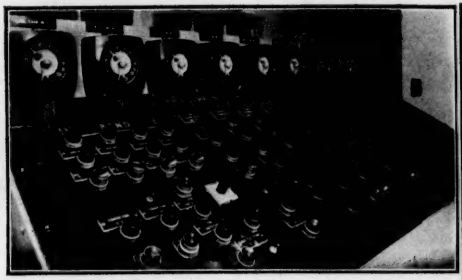
The Dam will be 340 ft. thick, at the base. The structure will require 1½ million cubic yards of concrete and 7½ million pounds of steel. The work was started in March of 1949, and will take between four and five years to complete; total cost, $70 million.

Water Power

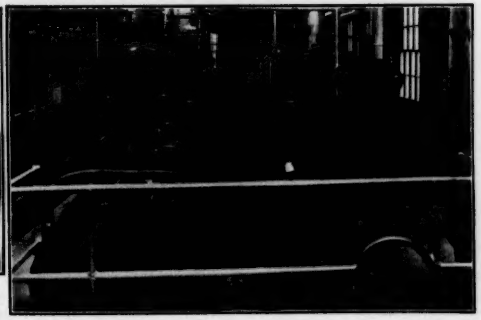
Under a head of 450 ft., the average flow of water, 2000 cubic feet per second, will produce 100,000 kw. of power. Another dam, to be known as the "Big Cliff", will later be built two miles below this one.

The contract for the construction was awarded by the Army Engineers to Consolidated Builders, Inc., who set up their headquarters at Mill City, Oregon, a few miles down the river. H. H. Roberts was then chief engineer, and R. A. Hoffman is general superintendent for Consolidated Builders, who are sponsors for a group of contractors, including Kaiser Industries; Pacific Bridge; General; Walsh; Shea, Utah Construction Co. and Bates & Rogers.

Stone for use in the structure is quarried from a mountain top on the south side of the river, and after being crushed is conveyed half a mile to the cooling and mixing equipment on the north side. When running at capacity, the system will supply 250 cubic yards of concrete per hour. Everything that goes into the mix is cooled. After being washed and screened, the stone is cooled by being inundated in large vertical tanks, through which water at 35 F is circulated. The grit is allowed to separate from the water in special settling tanks.



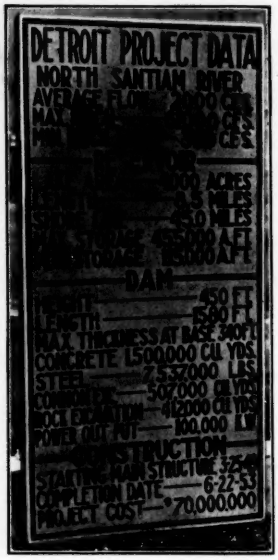
This control board eliminates hand work in cooling, mixing and conveying the material used for building the Detroit dam. It is installed in a tower overlooking the construction project.



Six 9 by 9 Frick compressors and one 8 by 8 deliver a total of 700 tons of refrigeration.

Cooling Equipment

The water is cooled in three shell-and-tube vessels, each 30 in. in dia. by 18 ft. long. Each contains 298 tubes of 1¼-in. size. Each shell is equipped with a float valve control and an oil-type liquid-level gage.



Engineering data on the Detroit Dam is provided for the public by this sign.

The sand and cement are cooled in a series of jacketed troughs, through which they are pushed by screw conveyors having hollow vanes. The water for the mix itself is cooled as close to freezing as possible in two shell vessels, 10 in. dia. by 15 ft. long, each containing 31 tubes of 1¼ in. size.

The concrete is prepared in batches of four cubic yards at a time. The buckets used on the cableways in placing the concrete are of 8 cubic yards capacity. Pre-cooling the concrete so completely makes it unnecessary to pump cold water through pipes imbedded in the mass as it hardens. Government specifications require that the temperature of the mix when placed in the forms be not over 50 F.

The entire operation of cooling and mixing the cement is electrically controlled from switches on an elaborate board, in a tower overlooking the project.

The refrigerating machines were installed in a building on a ledge over 1300 feet from the water and stone coolers. There are six Frick 9 by 9 machines, and one 8 by 8. All the compressors are driven at 400 rpm through V-belts. Ideal motors of 100 hp are used for all except the smallest compressor, which takes 60 hp. The three condensers are type MS shell-and-tube, 24 in. dia. by 15 ft. long. They are fed with water from the river by a pump handling 1200 gallons per minute.

The contract for the cooling equipment was awarded to the Lewis Refrigeration and Supply Company, Inc., Frick sales representatives in Seattle. Lewis also furnished pumps and tanks with control valves and accessories. The cooling equipment was put into operation in June, 1950.

MRO Rating Withdrawn on Paper Bags and Ammonia

CERTAIN scarce materials have been removed from the list of products which business firms, institutions and government agencies obtain by using a defense order rating (DO-97) for maintenance, repair and operating supplies, the National Production Authority, U. S. Department of Commerce, has announced. NPA said the action was necessary to insure an orderly flow of certain materials to the defense effort and to essential civilian production needs.

The following materials have been excluded from application of DO-97 ratings by the amendment to NPA Regulation 4:

Chemicals, nylon fiber and yarn, packaging materials and containers, paper and paper products, paperboard and paperboard products, paint, lacquer and varnish, products covered by M-47 (durable goods), rubber tires and tubes (already regulated under M-2), photographic film, rails, tie plates, track spikes, splice bars, rail joints, frogs and switches.

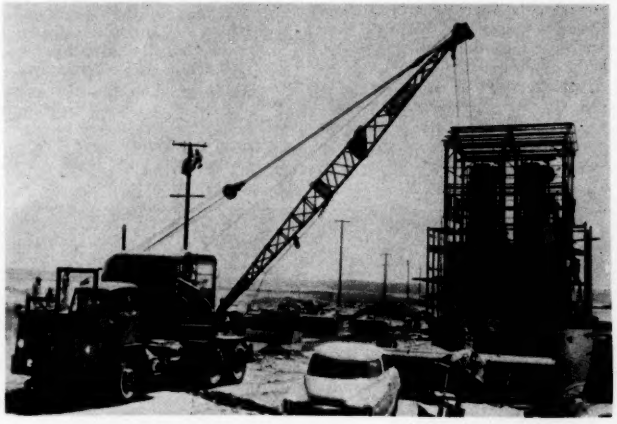
It had become evident, an NPA survey showed, that in some fields the piling up of DO-97 orders might interfere with defense production.

This order will affect the ice and other refrigerating industries chiefly on its purchases of paper bags and ammonia.

In addition, NPA said, programs for the allocation of certain scarce materials are being set up to distribute them evenly where needed. This is especially true in the chemical field where some already have been allocated and others will follow.

Further changes in Regulation 4 are being considered, NPA said, in addition to today's interim action, but it is not expected that the additional changes will affect the list given above.

Ice From New Plant Will Cool Concrete For Falcon Dam



Power shovel used in construction of ice plant near Falcon Dam

AN ice plant and ice storage plant is being built near the site of the Falcon Dam on the Rio Grande River near Laredo, Texas, with the help of a Lorain Moto-Crane, Model MC414. The ice produced will be used to cool cement for the dam and power house construction. Falcon Dam Constructors, Rio Grande City, Texas, are the general contractors.

Refrigerated Warehousing Industry

NATIONAL ASSOCIATION of REFRIGERATED WAREHOUSES

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THIS MONTH IN BRIEF

Cooler occupancy in public refrigerated warehouses for the first time since 1945 showed a decrease in April 30 holdings. Freezer space showed slightly higher occupancy for the month.

Report on studies for improving quality of Emperor and Almeria grapes, continuing from May issue, point to longer storage life being possible by using certain treatments and combination of treatments.

Refrigerated warehouse representatives meet in Washington with government representatives to consider effect of the controlled materials plan.

Manual on how to guard against sabotage tells workers in industrial plants how they can help.

Commodity storage manual issued by The Refrigeration Research Foundation supplies members with technical information on various storage commodities.

Cold Storage Holdings For April 30

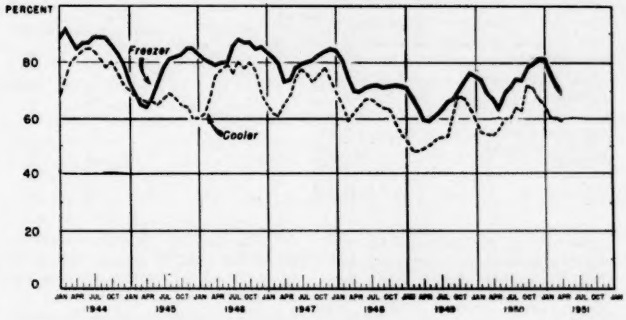
FOR the first time since 1945 cooler occupancy in public refrigerated warehouses showed a decrease during April. On April 30 cooler space was reported to be 59 percent occupied, a 1 point drop from the previous month's occupancy level. Usually the utilization of cooler space increases during April, the average increase being 3 percentage points. Cooler occupancy, however, did increase in the following regions: South Atlantic, East South Central, West South Central, and Mountain, while the occupancy level remained the same in the West North Central region. All other regions showed a decrease in cooler utilization.

Freezer space on April 30 was 69 percent occupied, reflecting a 3 point decrease from the March 31 level. This compares with an average decrease of 4 points for this time of year. The Mountain region was the only area showing an increase in the use of freezer space, while in the West North Central and East South Central regions there was no change from the previous month's occupancy level. St. Louis and Norfolk were the only cities in which both cooler and freezer space were more than 80 percent occupied.

A net withdrawal of 274 million pounds of cooler commodities reduced the weight of cooler-held foodstuffs to 1.5 billion pounds on April 30. This 16 percent decrease in commodity weight during April compares with a 9 percent reduction during the same period a year ago and an average weight reduction for this time of year of 8 percent. The net withdrawal of apples accounted for the greater part of the reduction in cooler weight. Cooler items showing a net weight increase during April were dried and evaporated fruits, nuts and nutmeats, cheese, shell eggs, pork, and canned meats. The weight of freezer commodities in storage April 30 amounted to 1.7 billion pounds, reflecting a net withdrawal of 88 million pounds during the month.

National holdings of fresh apples in storage April 30 were about half the amounts on hand a month earlier. With almost 7 million bushels in store, current stocks were twice average April 30 stocks and those of a year ago. Fresh pears were down to 139,000 bushels as compared with 185,000 last year and 101,000 bushels for the April 30 average.

Frozen fruits in storage fell off



Occupancy of public refrigerated warehouses 1944-1951

TABLE I—COLD STORAGE HOLDINGS IN PUBLIC, PRIVATE AND SEMI-PRIVATE WAREHOUSES, APPLE HOUSES AND MEAT PACKING PLANTS (000 LBS.)

	April 30, 1951	March 31, 1951	April 30, 1950	Five-year Average
Meat and meat products, lbs.	876,597	905,946	749,314	745,338
Lard and rendered pork fat, lbs.	76,833	78,352	108,105	116,815
Frozen poultry, lbs.	147,410	192,913	167,000	174,942
Creamery butter, lbs.	32,389	33,378	109,020	30,411
American cheese, lbs.	141,771	130,655	153,135	103,351
Other cheese, lbs.	19,773	18,736	15,347	15,456
Shell eggs, cases	990	309	2,147	2,872
Frozen eggs, lbs.	111,540	62,298	155,108	162,434
Apples, bu.	6,893	12,891	3,645	3,462
Frozen fruits, lbs.	205,229	245,331	150,915	223,548
Frozen vegetables, lbs.	272,227	294,223	241,992	199,570
Frozen fish, lbs.	88,878	96,367	79,027	73,551

40 million pounds during April as compared with 27 million pounds last year. Average March decline for the 5-year period ended 1950 was 34 million pounds. April 30 inventories of 205 million pounds were more than a third greater than stocks a year ago and were about 8 percent below average for this time of year. However, such fruit items as cherries, grapes, raspberries, and strawberries exceeded their respective April 30 5-year average storage stocks. Orange concentrate holdings increased 600 thousand gallons during April and totaled 10 million by the end of last month.

Frozen vegetables, down to 272 million pounds by the end of last month, reflected a 22 million pound seasonal decline. Except for frozen spinach, which increased 12 million pounds during April, all frozen vegetable items showed seasonal net declines, the greatest being in stocks of green peas, lima beans, snap beans, and sweet corn in the order named. The cumulative net withdrawals for these four items amounted to 27 million pounds, of which peas and lima beans accounted for 12 and 7 million pounds, respectively.

Storage holdings of creamery butter moved contra-seasonally in several areas which resulted in a net decrease in national holdings of about a million pounds. Total on hand April 30 of 32 million pounds compares with 109 million in store a year ago at which time storage holdings increased 16 million pounds. Cheese in storage at the end of last month increased one and a half times the average April increase and reached the total of 167 million pounds. A year earlier stocks amounted to 172 million pounds.

The net increase in shell egg stocks was about half the April average as national holdings increased by only 700,000 cases. With 990,000 cases in store by April 30, the national total was a little less than half last year's supply and about two-thirds less than average for this time of year.

Frozen egg stocks were up 49 million pounds since March 30 and by the end of last month totaled 112 million pounds. National supplies of frozen poultry were reduced by 46 million pounds during April and by the end of the month amounted to 147 million pounds.

Supplies of meats and meat products in refrigerated storages totaled 877 million pounds on April 30 as compared with 749 million in store last year. Average April 30 stocks were 745 million pounds. Beef holdings were reduced by 20 million pounds during April as compared with 9 million last year. Total beef on hand, 111 million pounds, was below average for this time of year but exceeded last year's supply by 20 million pounds. April net withdrawals of pork, 5 million pounds, were about a fifth of average and by April 30, pork in storage amounted to 643 million pounds.

April 30 storage holdings of fishery products amounted to 111 million pounds. Frozen fish in storage accounted for 89 million pounds as compared with 96 million in store last month and 79 million in storage a year ago.

TABLE II—PERCENTAGE OF SPACE OCCUPIED BY PUBLIC COLD STORAGE WAREHOUSES (APPLE HOUSES EXCLUDED)

	Net Piling Space (000 cu. ft.)		April 30, 1951 (%)		March 31, 1951 (%)		April 30, 1950 (%)		5-Year Average (%)	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	3,212	5,986	42	69	54	76	41	67	53	64
Middle Atlantic	35,449	30,060	56	68	58	73	42	60	54	67
East North Central	27,249	25,481	65	74	66	76	63	71	64	72
West North Central	9,869	15,216	65	84	65	84	80	83	71	77
South Atlantic	9,016	6,451	59	76	54	78	55	73	66	77
East South Central	2,547	3,110	71	77	64	77	65	83	75	75
West South Central	7,165	7,384	63	57	62	60	54	56	70	71
Mountain	1,476	2,106	73	69	68	67	81	68	79	78
Pacific	15,625	22,295	49	57	53	61	45	59	54	60
United States	111,608	118,089	59	69	60	72	54	67	61	70

TABLE III—PERCENTAGE OF SPACE OCCUPIED BY PRIVATE AND SEMI-PRIVATE REFRIGERATED WAREHOUSES AND MEAT PACKING PLANTS (APPLE HOUSES EXCLUDED)

	Private and Semi-Private Warehouses						Meat Packing Establishments					
	Net Piling Space (000 Cu. Ft.)		Space Occupied—Per Cent April 30, 1951		March 31, 1951		Net Piling Space (000 Cu. Ft.)		Space Occupied April 30, 1951		March 31, 1951	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	8	16	50	81	87	78	.....	.....	..	..	70	..
Middle Atlantic	1,650	1,793	39	78	46	80	1,408	258	85	87	87	88
East North Central	6,120	5,500	61	66	59	74	4,069	1,184	88	87	87	88
West North Central	579	2,390	89	73	86	75	12,304	6,091	91	89	90	90
South Atlantic	482	2,824	34	73	68	73	957	238	86	100	86	99
East South Central	.....	.....	..	..	..	..	274	74	91	91	93	88
West South Central	275	161	79	82	71	59	1,199	500	100	96	100	100
Mountain	102	41	98	20	93	..	767	437	90	98	91	98
Pacific	2,773	3,472	23	53	21	51	2,723	521	92	92	92	93
United States	11,989	16,197	50	67	51	69	23,701	9,303	91	90	90	91

NOTE:—Blank spaces indicate that insufficient returns were received.

MORE STORAGE TIME FOR GRAPES

Studies for improving quality of Emperor and Almeria grapes during season following that reported in Part I in May Issue verifies treatments that provide longer storage life.

WILFRED A. WALKER, OLIVER J. WORTHINGTON and ERNEST H. WIEGAND

Oregon Agricultural Exp. Station Department of Food Technology In cooperation with Refrigeration Research Foundation

This article continues from the May issue a report on studies for improving quality of Emperor and Almeria grapes in storage during the season. Results of previous treatments were verified and studies made of additional treatments. Conclusions point to longer storage life being attainable with certain treatments and combination of treatments.

IN THE season following that reported upon in Part I of this series, published in the May issue of ICE AND REFRIGERATION, the results of the better of the previous treatments were verified and additional germicides and films were investigated. Also checked were the effects of rinsing compared with not rinsing, the effects of a detergent wash alone, and the effects of two different concentrations in the dipping solution. A total of 30 combinations were used, including five of disinfection and six of overwrap. Wherever possible, commercial conditions were simulated. Approximately 3,000 pounds of Emperor grapes, comparable in every way to those obtained the previous season, were treated, stored at 33 to ± 2° F. in commercial storage (relative humidity 85 to ± 5 percent) and examined after 16 and 20 weeks.

Preliminary

Taste Panel: The same 12 to 16 experienced tasters made up the panel which performed all the taste tests in this study. As a standard procedure they evaluated four samples in each test. Among the samples was a duplicate, included to test the reliability of the tasters[1]. The results from those tasters unable to detect the duplicates at a given sitting were not used. Tasters were asked to assign a numberical value of from zero to ten for each sample. A score of five was just acceptable. A score of ten was labelled ideal.

A taste panel was conducted on freshly dipped grapes to determine the level of Dowicide C that was objectionable to taste. This panel indicated the upper acceptability level to be 1,000 ppm. (parts per million) with unrinsed, and 3,000 ppm on rinsed grapes. Dowicide A was found to have a similar taste at the same concentrations.

Wetting Agent. "Aresket", the wetting agent used by App, and others in Part I to improve the contact with the dipping solution, was not available at the time of this study. It was therefore necessary to find a nontoxic wetting agent that would give a maximum of wetting action in low concentrations. It was found by experimentation that 400 ppm active sodium alkyl aryl sulfonate was sufficient for this purpose. This wetting agent is used commercially in the washing of food products. It has the trade name of D-40, manufactured by Oronite Chemical Co.

Germicides Used

A. *Metabisulfite cushion—five grams.* This treatment has fairly widespread commercial usage, and served as a control[2]. Sodium bisulfite was used instead of potassium bisulfite. The former is used almost universally by the industry. It liberates an equivalent amount of sulfur dioxide and is less expensive.

B. *Dowicide C, 1,000 ppm unrinsed.* This method, used successfully by App, and others, provided a comparison of results.

C. *Dowicide C, 1,000 ppm. rinsed.* A fresh water rinse, immediately after the Dowicide dip was used to determine if it were possible to remove most of the Dowicide after short contact time and obtain similar results. The less mycostatic agent present gives better chances for Food and Drug acceptance of the product. Keinholz and associates[3] found satisfactory mold control with 6,000 ppm Dowicide C on pears which had been rinsed in fresh water immediately after treatment.

D. *Dowicide C, 3,000 ppm rinsed.* Similar to treatment C but with a higher concentration of germicide.

E. *Wetting agent, 400 ppm.* In all Dowicide treated grapes, 400 ppm of wetting agent was present to obtain a more complete coverage and freer rinse. The wetting agent was used alone to determine how much of the decreased growth of micro-organisms if any is due to germicidal action and how much is due to the physical washing action of the wetting agent.

F. *No treatment.* Serves as a control for each overwrap.

Overwraps

An exact designation of the films used may be obtained from the authors.

1. *Pliofilm, acetate window.* This is the method used successfully by App, and others, and it served as a basis of comparison. The cellulose acetate window (lumarith) was two inches square and was taped on with Scotch tape since lumarith does not heat seal well. The window allows escape of carbon dioxide gas, as pliofilm is highly impermeable to gas transmission.

2. *Pliofilm punctured.* Many workers have shown that punctured films retain their high moisture-vapor permeability, yet allow escape of gas. The three punctures used were "V" shaped and to prevent tearing were cut into the Scotch tape placed at the top center of the bag. If method one

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Published as Technical Paper No. 678 with the approval of the Director of the Oregon Agricultural Experiment Station.

*Condensed from thesis submitted in partial fulfillment of requirements for M.S. degree.

[1]Lorant, George and Wiegand, Ernest H. Tasting acceptability of food products, taste test procedure. Oregon State College Agricultural Experiment Station Circular of Information 446, Jan. 1949. 3 p.

[2]Pentzer, W. T. and Barger, W. R. A comparison of fungicidal treatments for the control of Botrytis rot of grapes in storage. Proceedings of the American Society for Horticultural Science 39:281, 1941.

[3]Keinholz, H. R., Robinson, R. H., and Deman, E. S. Reduction of pear rots in Oregon by the use of a chemical wash. Oregon State College Agricultural Experiment Station Circular of Information No. 460, Aug. 1949.

is satisfactory, it is of value to determine whether method two is equally satisfactory, as it is simpler and less expensive.

3. *Cellophane, punctured.* This material is used extensively in commercial practice with fresh fruits and vegetables.

4. *Polyethylene.* This film is coming into wide usage. It is structurally strong, rates second to cellophane in cost, is highly moisture-vapor proof, and allows diffusion of the gases produced by the living grapes.

5. *No wrap.* Control.

Procedures

Approximately 25 pounds of grapes were dipped at one time into 20 gallons of solution in a stainless steel tank. The time was one minute, with slight agitation. Where a rinse was specified, the basket of grapes were immersed for 15 seconds in a stainless steel tank containing 20 gallons of fresh water. This was done immediately after the germicide dip.

Evaluation for Mold

After 15 weeks storage, it was evident that considerable mold growth had occurred and that the controls were more than 50 percent unsalable. Two of the four lugs of each treatment were removed for evaluation. The extent of mold was designated by separating into three groups the bunches of grapes considered, moldy, slightly moldy, or not moldy in the manner of App, and others. A typical example of each group was illustrated in Figs. 1, 2 and 3 in Part I. For simplicity the classes were reduced from three to two, namely salable and unsalable. The grapes having "light mold" as well as those having no mold were classed as salable since a little judicious trimming of the bunches would make them salable. Please note that in Part I, App and others included in the salable group only those having no mold. Thus their percent salable figures would be a little lower for an equal storage period.

tion of the grapes in the different lots. Mold growth in these last four weeks was very rapid in some cases (4D) but rather slow in other cases (1A). At the end of 20 weeks the differences in the treatments became more conspicuous. In order to determine significant treatments, the salability of all lugs of each treatment was averaged as presented in Table II. It will be noted that 11 combinations of treatment and overwrap were significantly better than the controls. However, some of these were later eliminated because of off-flavor.

Observations at Time of Mold Examination

Treatment A (sulfite cushion). Presence of natural bloom was noted. Some bleaching had occurred at the stem end. Gray molds (*Botrytis* sp) were predominant. A noticeable zone with no mold was noted in the bottom inch of lug with wraps 2, 3, and 5.

Treatment B (1,000 ppm Dowicide C unrinsed). Good general condition was noted. Grapes were slightly moist. No bloom was present at first, but some appeared when the fruit was allowed to stand open for several hours. There was a slight dull-

TABLE I—AVERAGE PERCENT SALABLE FOR THE 16 AND 20 WEEK STORAGE PERIODS

	Film Used	Weeks Storage	A*** 5 gm Sulfite cushion	B*** Unrinsed 1,000	C Dowicide C, ppm Rinsed 1,000	D Rinsed 3,000	E 400 ppm Wetting Agent	No Treatment
1.	**Pliofilm 75 FF	16	‡86.5	100.0	21.2	76.5	2.5	63.0
	Acetate window	20	76.0*	100.0	4.0	35.0	0.0	29.5*
2.	Pliofilm 75 FF	16	70.5	74.5	2.5	2.5	0.5	5.0
	Punctured	20	40.0*	61.5*	0.0	0.0	0.0	0.0
3.	Cellophane MSAT 86	16	58.0	45.5	2.5	5.0	0.0	0.0
	punctured	20	39.0*	16.0	2.5	0.0	0.0	0.0
					99.0			
4.	**Polyethylene .0015	16	90.5	84.5	86.0*	80.5	7.5	37.5
		20	47.5*	64.5*		9.0*	5.0	19.5
5.	No wrap	16	29.0	‡45.0	17.0	13.5	6.0	3.5
		20	4.0	14.5	0.0	0.0	0.0	0.0

(*) Combinations significantly superior to 5A.
(**) Wraps significantly superior to 2, 3 and 5.
(***) Treatments significantly superior to C, D, E and F.
‡ Verification of work of App. and others.

If there were any changes in the concentration of the dipping solution, they were probably very small. A total of 500 pounds were dipped in a given solution and the dipped grapes were randomly assigned to the various overwraps. There were no analytical methods available for readily determining changes in concentration.

The grapes were drained in a current of air for one minute to simulate commercial straight line production.

Each overwrap was fabricated in the form of a bag holding approximately 25 pounds. These were heat sealed, replaced into the lugs, renailed, and placed in commercial cold storage at 32 to ± 2° F. The relative humidity was 85 to ± 5 percent.

The average percent salable for both 16 and 20 week storage periods is shown in Table I. Each average represents two lugs, or fifty pounds of grapes. Study of this table will reveal the varying rates of deteriora-

TABLE II—RESULTS OF TEST ON EMPEROR GRAPES SHOWING MEAN PERCENT SALABLE AFTER 16 AND 20 WEEKS STORAGE

Wrap	Treatment A	B	C	D	E	F
1.	81.2*	100.0*	12.7	55.7*	1.2	46.2*
2.	55.2*	58.0*	1.2	1.2	0.2	2.5
3.	48.5*	30.7	2.5	2.5	0.0	0.0
4.	69.0*	79.5*	92.5*	44.7*	6.2	28.5
5.	16.5	29.7	8.5	6.7	3.0	1.7

The least significant difference between any two of the means is 22.51 (5% level).
* Significantly better than control, 5A.

ing of color. Mold growth noted, in order of predominance, was: blue (*Penicillium* sp.), *Aspergillus* sp. and *Botrytis*, sp.

Treatment C (1,000 ppm Dowicide C rinsed). The same remarks about bloom noted in treatment B apply here. *Penicillium* sp. was the predominant mold.

Treatment D (3,000 ppm. Dowicide C rinsed). The same remarks about bloom noted in treatment B apply here. *Penicillium* sp. was the predominant mold. A considerable amount of free liquid was noted in the bottom of lugs using punctured pliofilm and cellophane. Grapes in the other wraps were moist.

Treatment E (400 ppm. wetting agent). Very poor general condition was noted. Grapes had no bloom and were soft. Considerable shattering occurred when the bunches were picked up for examination. Dense, mixed microflora was noted, and grapes at the bottom of lugs wrapped with number 1, 2, and 3 were "soupy". Evidently the protective wax present on the surface of grapes is removed by washing.

Treatment F (no treatment). General condition was noted to be poor, although better than grapes which were simply rinsed in the wetting agent. The microflora was mixed, with *Botrytis* sp. predominant. Grapes at the bottom of lugs wrapped with number 1, 2, and 3 were "soupy".

Overwraps. The type of predominant mold depended on treatment and not on wrapping material. The most outstanding result here was that No. 5 (unwrapped) exhibited considerable shriveling of the top layer.

Stratification. The noticeable stratification of perfect grapes at the bottom of lugs using the sodium bisulfite cushion was not expected, as no report of this phenomenon was noted in the literature. However, van der Planck's attempt to control the amount of sulfur dioxide liberated by sodium bisulfite by controlling the amount of moisture available to release sulfur dioxide[4] is noteworthy.

It may be simpler to use a film that allows sulfur dioxide gas to pass through at a constant rate. Yang[5] is using polyethylene bags to maintain a free sulfur dioxide concentration in wine. Instead of a single cushion at the bottom, it may be practical to distribute several small heat-sealed packages of polyethylene containing this material, throughout the lug. As a result, distribution of gas would be much more uniform.

[4]van der Plank, J. E. A device for the regulated release of sulphur dioxide in packages of stored table grapes. Report of the Low Temperature Research Laboratories, Capetown, South Africa 1937-38, p. 76-78, 1939.

[5]Yang, Ho-Ya. Food Technology Department, Oregon State College, Personal Communication, Nov. 1949.

TABLE III—ANALYSIS OF SALABILITY AND FLAVOR AT END OF 20 WEEKS

Code	Percent Salable	Treatment	Overwrap	Flavor Rank
1B	100	1,000 ppm Dowicide C unrinsed	plio—window	not acceptable
4C	86.0	1,000 ppm Dowicide C rinsed	polyethylene	5
1A	76.0	SO_2 cushion	plio—window	*
4B	64.5	1,000 ppm Dowicide C unrinsed	polyethylene	not acceptable
2B	61.5	1,000 ppm Dowicide C unrinsed	plio—punctured	not acceptable
4A	47.5	SO_2 cushion	polyethylene	*
1D	35.0	3,000 ppm Dowicide C rinsed	plio—window	2
2A	40.0	SO_2 cushion	plio—punctured	*
3A	39.0	SO_2 cushion	cellophane	1
1F	29.5	none	plio—window	6
4D	9.0	3,000 ppm Dowicide C rinsed	polyethylene	3
5A	4.0	SO_2 cushion (Control)	none	insufficient sample
Comm'l.	....	periodic warehouse gassing	none	4

* Eliminated from further taste testing after 16 weeks because of border-line acceptability.

Flavor Evaluation. Mold growth is not the only criterion of salability so that the 11 treatment combinations which were significantly better than the controls were then subjected to flavor evaluations. The preliminary taste panel on fresh grapes (under the method reported by Lorant and Wiegand[1]) reported that dips in solutions up to 1,000 ppm. Dowicide C followed by rinsing were acceptable. However, the same group of tasters consistently down graded the 1,000 ppm. unrinsed Dowicide C grapes on the stored product. This eliminated from further consideration treatments 1B, 4B, and 2B (Table III). Thus eight remained for flavor evaluation.

The panel of flavor evaluators scored six different treatment combinations at the end of 20 weeks and these are ranked in Table III. For comparison a commercial sample was locally purchased on March 29. Although shriveled, the flavor was acceptable. The samples ranked in Table III had scores in the range of 5.8 to 7.0 wherein 10 is ideal and 5 is just acceptable. While it is emphasized that too much weight should not be attached to the ranks here, it gives a fair indication of the trend and especially whether acceptable or not. The flavor ratings after 16 weeks had been approximately the same.

Conclusions

1. The present commercial use of a sodium bisulfite cushion can be significantly improved by using any of the transparent films as used in this investigation. Longer storage life is attained.

2. Dowicide C at the level of 1,000 ppm unrinsed is not acceptable due to off flavor, although excellent mold control is attained.

3. Use of 1,000 and 3,000 ppm Dowicide C when rinsed in fresh water prior to storage indicated promising commercial applications, when both were wrapped in polyethylene, or the latter with pliofilm (cellulose acetate window). Some loss of bloom is evidenced in all dipping treatments. The flavor evaluations also indicate that further investigation of these treatments is warranted.

4. The inhibition of mold is caused by the mycostat, and not by the physical washing action of the wetting agent. Washing grapes in wetting agent alone makes them more susceptible to infection.

5. Moisture loss and shriveling of grapes in storage are controlled by wrapping with transparent film. No off-flavors were noted due to suboxidation (anaerobic respiration) as the films used (or their modifications) were permeable to respiratory gases.

6. *Botrytis* sp. was the predominant mold growth in untreated and sulfur dioxide treated grapes. *Penicillium* sp. was predominant in Dowicide A and C treated grapes.

7. Pliofilm with a cellulose acetate window is superior to punctured pliofilm as a wrap for Emperor grapes in storage.

8. In general, the superior films were found to be polyethylene and pliofilm with cellulose acetate window.

Pacific States Warehousemen Meet

FORTY-THREE members of the Pacific States Cold Storage Warehousemen's Association gathered for its three-day annual meeting, April 4, 5, and 6 at the Arrowhead Hot Springs Hotel in San Bernardino, Calif. Election of new officers was a highlight of the occasion with Millard W. Young of San Francisco taking over as the organization's new president. He succeeds H. J. Nissen of Los Angeles. Other officers elected were: Vice-presidents, A. R. Carstensen, Frank Degan, Glenn Dodson and Jack H. McGoldrick; Treasurer, H. G. Hacke.

Dr. Samuel Prescott led off the technical end of the association program, pinch-hitting for Prof. F. W. Allen who was unable to appear because of illness. Dr. Prescott presented a detailed report on the History of Food Technology. He particularly stressed the work being done for the industry by The Refrigeration Research Foundation.

Dr. D. H. Dewey and A. L. Ryall of the U. S. Department of Agriculture discussed ammonia injury to fruits and nuts in storage. Dr. Dewey's presentation included interesting slides showing the results of tests wherein sulphur dioxide was used to help relieve ammonia damage. According to Dr. Dewey, present indications are that only grapes and certain types of nuts respond favorably to the sulphur dioxide treatment.

Frozen Food Research

Outlining some recent developments in frozen food research, Dr. R. R. Legault of the Western Regional Research Laboratory told of experiments conducted by his organization to perfect a concentrated apple juice containing a large percentage of juice from the "Delicious" apple. The new concentrate is currently undergoing market tests in both California and Texas. According to Dr. Legault, the apple concentrate quality is excellent. The concentrate is stored at temperatures varying from 32 to 40 F. and under such conditions has a shelf life of three months at room temperature.

Howard G. Greas, rate expert of the California Public Utilities Commission, also addressed the Pacific States delegates. In his talk, entitled "The Commission and the Cold Storage Industry," Mr. Freas outlined the California Public Utilities commission's duties and responsibilities with respect to the public warehousing of cold storage commodities.

Refrigerating Warehousemen Weigh Effect of Controlled Materials Plan

Staff members of the National Association of Refrigerated Warehouses met with government officials April 19 in Washington, D. C. to discuss the possible effect of the Controlled Materials Plan on refrigerated warehouse operators. Left to right: R. F. Curry, N.A.R.W.; William Dalton, N.A.R.W., executive vice-president; A. Gordon Wooton of the National Production Authority; Harold K. Osgood, Defense Transport Administration; Sterling Smith, NPA; H. R. Pellegrino, DTS; J. H. Colquitt N.A.R.W.

Fact Finding Conference In Kansas City, Mo.

THE Institute of American Poultry Industries will stage its twenty-third annual Fact Finding Conference February 10, 11 and 12, 1952, in the Municipal Auditorium, Kansas City, Mo.

"The trend toward more vertical operations will keynote next year's conference program," commented Cliff D. Carpenter, Institute president, "and we expect to place major emphasis on streamlined marketing methods between farm and processing plant and between processing plant and retail store — as the primary means of bringing consumers better products at reasonable prices and reflecting greater returns to producers."

Floor plans for the 1952 conference exhibit will be completed by June and invitations to exhibit will go out immediately afterward, to firms handling equipment, supplies and services essential to the efficient production and marketing of poultry and egg products with top consumer appeal.

Van Camp Sells Costa Rican Refrigerating Plant

THE large refrigerating plant operated by the Van Camp Sea Food Company at Punt Arenas, Costa Rica, has been purchased by the Pacific Refrigeration Co. of Oakland, Calif. Under a new concession granted by the Costa Rica government, the plant will be operated as a public utility, but will continue to receive fish from tuna boats operating for Van Camp in Central American waters.

Van Camp said the sale was the result of the company's new policy of confining its operations in continental United States. The company recently liquidated its subsidiaries and holdings in Mexico and Peru.

Group Insurance Grows

THE N.A.R.W. group insurance plan celebrated its first anniversary May 15. From a small beginning the plan has grown continuously during the past year with increasing numbers of N.A.R.W. members signing up to participate in its many benefits. At least three of these members got returns on their total premium investment ranging up to 1785 percent. These are the three to whom claims totaling $12,500 were paid during the past 12 months when death claimed valued employees. In addition participants received benefits in reduced labor turnover, higher morale and other advantages.

SABOTAGE—How to Guard Against It

In this period, it is urgent that every worker be aware of the dangers of sabotage. The nation's surplus foods in warehouses may be vulnerable to attacks. The statement on this page presents a needed organized resistance.

LABOR leaders and industrialists know that Communists will use new and ingenious efforts to burrow into union ranks to sabotage defense production. All America knows that in the skilled hands of the nation's workers rests the fate of 150,000,000 Americans—of all humanity. They, the workers, the productive army upon whom our national security depends, must not fail.

There is—right now—within this country's borders a highly-organized, perfectly-synchronized, well-protected fifth column of saboteurs whose operations have caused actual cases of sabotage, and a mounting wave of industrial "accidents" so frightening in proportions we dislike to think about them.

Our decision that we will not let Communism spread and engulf any more countries is the "all-out" signal for deadlier, more widspread sabotage by Communist agents. But even these agencies (law enforcement) can do no better than hope to keep acts of sabotage at a minimum. They need the help of every plant worker.

To The Workers—How They Can Help

A—Remember YOU are an American. Remember YOU are a soldier in the "front line" of industry. Remember YOU are as important to the security of this nation as any general.

B—Keep a close watch during working hours as to the state of your tools, equipment, and machines, for any sign of breakdown or tampering.

C—Make an immediate report to your superiors of any act which you consider "suspicious," or harmful to the plant's production.

D—Never allow yourself, for personal or other reasons, to point a finger of suspicion at a fellow worker with a revenge motive.

E—Be more than willing to cooperate with any suggestions made by your employer for such protective measures as they consider urgent for the plant's protection. (Fingerprinting is considered unnecessary by some workers, but anyone who has nothing to hide and is anxious to aid America should have no objection to submitting to it.)

F—Don't be offended when plant guards "frisk" you before you enter the plant. This is no condemnation of you personally. You should submit to it with an idea of patriotism. (Many innocent workers carried deadly tubes of nitro-glycerine into plants in their lunch boxes during the last war. When the boxes were opened the innocent workman and his fellow-workers suffered instant death, or crippling injuries.)

G—Never associate with a person of doubtful reputation. This person might be working for an enemy agent and even if he is not, suspicion might be cast on you as the result of this association.

H—If you are in financial troubles try to iron them out yourself. If you find you can't, seek the advice of someone you can trust. Never accept gifts, or money from strangers. You certainly will be indebted to them and they might be hostile agents seeking to win your confidence. Even though you are not responsible for any act of sabotage which might be committed in your plant the fact that you accepted money from an agent might come to light during the subsequent investigation and you'd have a lot of explaining to do.

I—Do your job to the best of your ability at all times. Never allow anything to cause a "slowup" in the productivity of the plant. Remember, that is what an enemy agent is willing to pay cold cash for. You are aiding him when you idle on the job.

J—Obey the plant rules for the good of all. Take all grievances to the proper authorities. Do not air them vocally in the plant or outside. Enemy agents have their ears turned for "grievances" as a sign of breakdown and will pounce on your grievance as an opening wedge.

K—Do not allow yourself to become excited by so-called "pacifist" groups who will put in appearance. Your own common sense is the best measure of what is good for you and what isn't. It's plain to see America must arm for self-defense. Pacifism has no place in this scheme.

L—Keep your ears and eyes open. You might be responsible for the detection of something that might involve the lives of your fellow-employees, or a collapse of the plant production which would lead to an end of operations, meaning "payless days" for you.

M—Keep in mind that each soldier in the field must have five workers in the factories and plants behind him. For every worker who shirks his job, that soldier is one-fifth less effective. When you shirk on the job you undermine our national defense.

N—Don't talk to strangers. Careless talk may cost lives. Walls have ears, gossip and rumors are the tools of the saboteur. Telephones are not instruments to be used in telling secrets. Beware of the stranger who asks questions, particularly the "friendly fellow" who wants to know all about your job. (Saboteurs prefer to work through willing, or unsuspecting workers. It removes them from risk of detection and arrest.) Remember: Silence is golden at all times; in an emergency it is more precious than gold.

O—Watch your physical condition. A sluggish body or mind might cause you serious injury, or death. It might cost the limb or life of a fellow worker. It might disrupt plant production. Don't take chances.

P—Be alert for the new worker who has not as yet learned the importance of safety and who, through carelessness, may threaten the safety of others, as well as the effectiveness of the plant and equipment.

Q—In the push for production, equipment may sometimes be overloaded—fire hazards are increased. Promptly report dangerous situations of this sort to your supervisor.

R—Report immediately any series of delays which to you seem needless, or "suspicious" with an idea toward finding out what is causing them, and who might be responsible for them.

S—Be alert to the introduction or substitution of inflammable materials or liquids into production in place of the safer fluids already in use.

T—Make it your job to see that all inflammable materials are disposed of properly. (Arson is the chief weapon of the saboteur.) See to it that fire exits, fire escapes, and other exits and entrances are kept clear.

U—If you see a stranger in or near the plant who does not seem properly identified, do not hesitate to ask who he is. Check up on him until the proper authorities have assured you his presence is proper.

V—Keep in mind that the army Stalin and his partners fear most is the army of American working men on the march to the plants of this nation. Stalin knows a united America can produce in greater quantities than any other nation on earth BUT—he knows America must be united; have the good will of the nation's workers, to accomplish this task.

W—Lastly, be American. We must all pull together regardless of race, creed, or color, or political faith.

Reprinted from the manual, "Sabotage—How to Guard Against It," by Harry Desmond Farren. Published by National Foremen's Institute and distributed by the National Association of Refrigerated Warehouses.

Commodity Storage Manual Issued by T.R.R.F.

COVERS and first loose leaf pages of the commodity storage manual have been received by members of the Refrigeration Research Foundation. This is a new undertaking by T.R.R.F. and is designed to supply the members with technical information on various storage commodities. It is expected to be thorough and comprehensive and practical. It is loose-leaf binding which will make it possible to add additional pages from time to time and to remove and insert revised pages as new information develops.

Information and illustrations for some of the facts have come directly from operating plants. An effort has been made to present all information in terms of practical operation, the purpose being to make this something in which refrigerated warehousemen can have a part.

New York Warehousemen Annual Meeting

THE annual meeting of the New York State Association of Refrigerated Warehouses was held April 27 at the Hotel Sheraton, Rochester, N.Y. Thursday evening, preceding the general meeting a dinner session of the Executive and Legislative Committees was held.

Present at the meeting were representatives of the North Atlantic Chapter, N.A.R.W., and from the federal and state governments who gave the latest information on controls and regulations as they affect the refrigerated warehousing industry. A report was given on legislation passed at the last session of the Legislature. A group luncheon was served for members and guests.

Binghamton Warehouses Merge and Expand

THE Binghamton Cold Storage Co., Binghamton, N.Y., has acquired the refrigerated warehouse facilities and the name of the Binghamton Refrigerating Co., Inc. Over 34,000 cu. ft. of freezer space has been added to existing facilities as part of a long range expansion program to handle the increased volume of frozen perishable foods. Among other features of the company's modernization and expansion program are the installation of new handling equipment and break-up and customer-tenant space.

Ammonia Fumes Escape From Broken Pipe-line

AMMONIA fumes from a broken underground refrigeration line in downtown Los Angeles recently drove office workers and others to the street. Firemen sprayed open manholes to dissipate the fumes while engineers descended below to shut off the main valves. Many persons were nauseated but no one was reported overcome. The break occurred in a main junction in the high pressure ammonia lines of California Consumers Corp., which supplies hotel and restaurant refrigerating systems in the downtown section. Mike Julius and E. G. Barrio, two of the concern's engineers, took turns being lowered by firemen to shut the valves.

New Warehouse for California Fruits

THE B. H. & O. Cold Storage Company is building an addition to its plant in West Orange Cove, Calif., near Fresno, at a cost of $95,000. It will increase present cold storage capacity by more than 68,000 lugs of grapes and other fruits. The standard size of shipping box in California is known as a lug for grapes and some other fruits. It is essentially the same thing as a bushel box. Top capacity is approximately 225,000 lugs.

The B. H. & O. plant was built more than three years ago by Fred Bear, Herman Bear, Carl Olson, Harvey Hansen and Floyd Olson, the present owners.

Completion of the new addition is expected about the end of July. The plant is equipped to meet all the agricultural cold storage requirements of the San Joaquin Valley.

New Refrigerated Warehouse

A NEW wholesale produce warehouse has been completed by the Pure Ice & Cold Storage Company at Jersey City, N. J. Cost of the warehouse was placed at $200,000. It has about 20,000 square feet of floor space. The building was erected chiefly to fill storage space requests of produce men.

Among its features are newest-type refrigerating units, truck docks and sanitation equipment. The refrigerated warehouse facilities of the company consist of about 700,000 cubic feet. Of this 200,000 cubic feet are devoted to sharp freezers for frozen products; the rest, somewhat lower temperature, for fresh fruits and vegetables.

The company also supplies pipeline refrigeration to various industries connected with its properties, manufactures ice and maintains frozen food lockers.

Frozen Fruits and Vegetables in Storage

STORAGE stocks of frozen peaches, raspberries, and strawberries on March 31 amounted to 94 million pounds. Three-fourths of this amount was classified by warehousemen according to package size. This coverage was 4 points below the previous month's, but 2 points above that of a year ago this time.

COLD STORAGE STOCKS OF FROZEN FRUITS AND VEGETABLES IN PACKAGES OF ONE POUND OR LESS IN STORAGE FEB. 28, 1951 AND MAR. 31, 1951
(000 lbs.)

	Mar. 31 1951		Feb. 28 1951	
	lbs.	pct.	lbs.	pct.
Peaches	1,843	22	2,297	19
Raspberries	4,321	29	5,110	28
Strawberries	19,580	41	23,738	39
Asparagus	2,597	74	3,293	75
Beans, lima	16,569	59	20,132	64
Beans, snap	11,604	66	14,160	69
Corn, sweet	8,348	51	9,907	53
Peas, green	26,996	65	33,457	66
Spinach	5,996	77	5,849	72

Twenty-two per cent of the peaches, 29 per cent of the raspberries, and 41 per cent of the strawberries were in packages of one pound or less. Comparable distribution on February 28 was 19, 28, and 39 per cent, respectively. A year ago this time peaches in the smaller-sized containers comprised 45 per cent, raspberries 19 per cent, and strawberries 34 percent of classified stocks.

Packaging data for the six frozen vegetables in storage March 31 covered 65 per cent of the stocks on hand. This equals last month's coverage and exceeds that of a year ago by 6 points. The proportion of spinach in retail containers increased 5 points during March to 77 per cent of the stocks classified. All other vegetable items decreased in the ratio of retail to institutional-sized items.

Fifty-nine per cent of the lima beans were in the smaller-sized container on March 31 in comparison to 64 per cent a month earlier. Snap beans and corn in retail containers comprised 66 to 51 per cent of classified stocks, a decrease of 3 and 2 points, respectively, since February 28, while the proportions of asparagus and peas in this type container each dropped 1 point to 74 and 65 per cent.

Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

Leo J. Vivien, New Orleans, La.
Chairman, Board of Directors, National Association Practical Refrigerating Engineers

NEWS

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Large Centrifugal Refrigerating Compressor

Their advantages in industry particularly for large tonnages. High rotative speeds make them readily direct-connected to electric motors and to steam or gas turbines

H. G. VENEMANN
Professor of Refrigeration
Purdue University

I HAVE chosen to discuss this subject for several reasons, namely: (1) So far as I know it has never been discussed at any of our previous NAPRE conventions, nor in any of the literature sent out by the Educational Committee. Our two official texts mention them only briefly without explaining the principles governing their operation.

(2) I have been urged by some of our members and chapter instructors to discuss basic physics, and I thought that this would offer an excellent opportunity to do it.

(3) Since I have not done any operating of refrigerating plants for many years, any paper that I present must of necessity deal with principles rather than with problems of immediate practical value.

The chief reason why centrifugal compressors have not been discussed by our association is because there has been no demand from our members, most of whom are interested primarily in ammonia compressors which are either of the reciprocating or rotary type, and of comparatively small capacities, whereas centrifugal ammonia compressors are not built in sizes under 500 tons.

The centrifugal compressor is primarily a high volume (cfm of refrigerant vapor) machine. Present standard design considers it impractical to apply a centrifugal compressor to an inlet gas volume of less than 1500 cfm. The true limiting factor, however, lies in the discharge gas volume of the final stage impeller which at present should not be less than 400 cfm, due to the increasing friction losses and tendency to instability of the impellers when handling smaller volumes.

Presented to the 41st Annual Meeting, N.A.P.R.E.

Demand Increasing

Centrifugal machines using refrigerants other than ammonia are being operated by some of our members. I remember seeing three large Freon 11 machines of this type in the engine room of the Roosevelt Hotel in New Orleans during our national convention two years ago. These were used for air conditioning. Other members operate brewery plants where centrifugal units using Freon are combined with existing ammonia low side equipment. These are appropriate in steam driven plants where exhaust steam from the turbine can be used in plant processes and heating, Fig. 1.

The petroleum industry offers many examples of centrifugal refrigeration. One company lists a 4 stage compressor having a displacement of 60,000 cfm requiring 22,000 shaft horse-power.

The demand for centrifugal compressors especially in sizes above 200 horse power is increasing rapidly. According to a bulletin recently published by the Census Bureau of the U. S. Department of Commerce the following comparison is made of centrifugal and reciprocating compressor shipments during 1949.

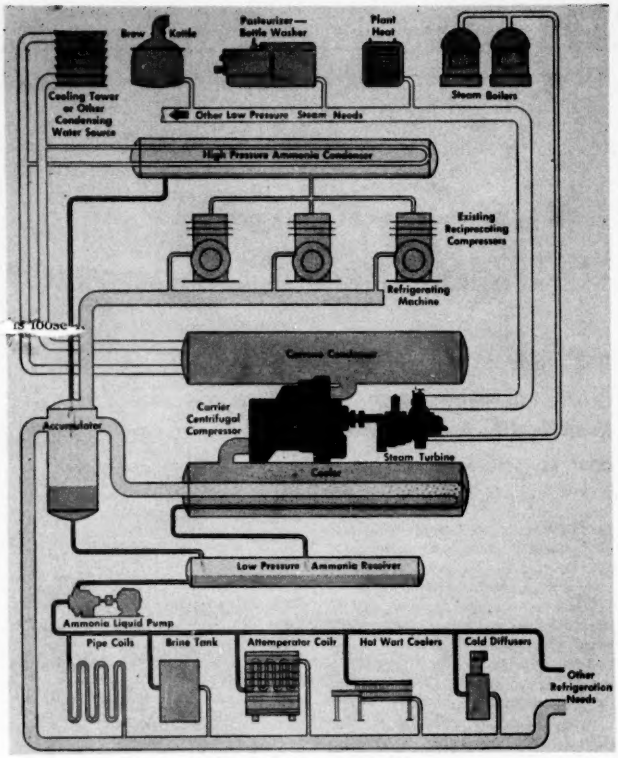
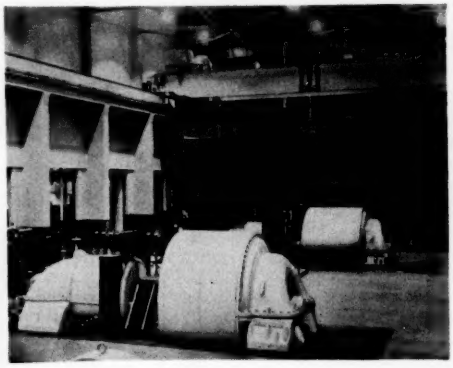


Fig. 1—Combined ammonia condensing and ammonia compression system in a brewery—Carrier Corp. illustration

Size of compressor	Centrifugal	Reciprocating
101 to 200 hp	75	241
201 to 300 hp	93	20
301 to 400 hp	43	15
401 to 500 hp	74	9
Total	285	285

Recently ICE AND REFRIGERATION printed a story about the late Dr. Willis H. Carrier. The story was illustrated by a photograph of Dr. Carrier standing beside the first centrifugal compressor invented by him in 1921. The photograph was taken during ceremonials to mark the completion of Carrier's 2000th centrifugal compressor.



Ingersoll - Rand reports that they have been building Turbo-Blowers for almost 40 years. These are built in displacements up to 130,000 cfm and against discharge pressures above 225 lb. per sq. in., Fig. 2.

Fig. 2—Two Ingersoll-Rand blast furnace blowers– Kaiser Company, Inc., Fontana, Calif.

Basic Physics

Feet Head and Pressure Head

The capacity of a centrifugal compressor like that of a centrifugal pump or of a fan or blower is usually given in terms of volume pumped per minute at intake conditions against a specified head. If the volume pumped is given in cubic feet per minute, cfm, and the specific volume, v, (cubic feet per pound) of the fluid at intake conditions is known, the weight rate of flow, in pounds per minute, w, is computed by the equation:

$$w \text{ per minute} = cfm/V. \qquad \text{(Eq. 1)}$$

The head against which the fluid is pumped is given as elevation in feet, h, or in pressure, p, lb per sq in. Either of these may be converted into the other if the specific volume, v, of the entering gas is known, by use of the equation

$$h = 144\ pv \qquad \text{(Eq. 2)}$$

Example 1. Air having a specific volume of 13.89 cu ft per lb is to be delivered against a head of 15 psi. Convert this pressure head into elevation in feet.

Solution: $h = 144 \times 15 \times 13.89 =$ 30,000 feet. This means that a column of this air 30,000 feet high having a uniform specific volume of 13.89 cubic feet per pound all the way from bottom to top and a cross-sectional area of 1 square foot would weigh 2160 pounds, thus exerting a pressure of 2160 lb per sq ft at the bottom of the column. A pressure of 2160 lb per sq ft is equal to 2160/144 or 15 lb per sq in.

A column of this air 2000 ft high would exert a pressure of 1 lb per sq in. at the bottom, because a column 2000 ft. high and 1 sq in. in cross-sectional area would weigh 1 pound.

Gas Velocity Produces Head

The head produced by a centrifugal pump or by a centrifugal compressor is the result of the centrifugal force imparted to it by the wheel or impeller and may be computed from the equation:

$$h = \frac{V_2^2 - V_1^2}{g} \qquad \text{(Eq. 3)}$$

h = head in feet of intake gas.
V_2 = velocity in ft per second of gas leaving impeller.
V_1 = velocity in ft per second of gas entering impeller. (usually negligible).
g = 32.2, the gravitational acceleration in ft per second per second.

The head in feet depends only upon the initial and final velocities of the gas being compressed and is inde-

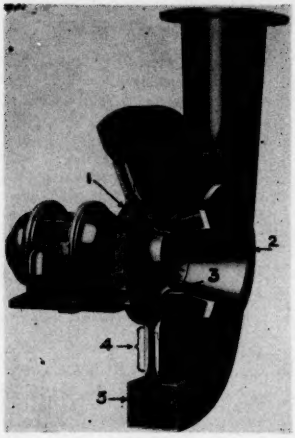


Fig. 3 — Ingersoll-Rand single stage blower

pendent of the fluid being pumped. Thus it is often stated that a centrifugal compressor operating at a given speed will produce a definite pumping head expressed in feet of the fluid being pumped regardless of the specific volume of the fluid.

Example 2. Given an initial velocity, V_1, of 20 ft per sec., and a final velocity, V_2, of 700 ft per sec. to find the head in feet.

$$h = \frac{700^2 - 50^2}{32.2} = 1514 \text{ ft}$$

Since the formula does not mention the fluid being pumped the head in feet would be the same for water as for the air in Example 1.

If, however, the head is to be given in terms of p, lb per sq in. instead of feet, h, the specific volume of the fluid would make considerable difference.

Example 3. Find the head in lb per sq in. for pumping (a) air having a specific volume of 13.89 cu ft per lb, and (b) for water having a specific volume of 0.016 cu ft per lb if the initial and final velocities are 50 and 700 ft per second as in Example 2.

Solution by the use of Equation 2

$h = 144\ pv$ and

$$p = \frac{h}{144\ v}$$

Therefore for the the air

$$p = \frac{1514}{144 \times 13.89} = .757 \text{ lb per sq in.}$$

and for the water

$$p = \frac{1514}{144 \times .016} = 657 \text{ lb per sq in.}$$

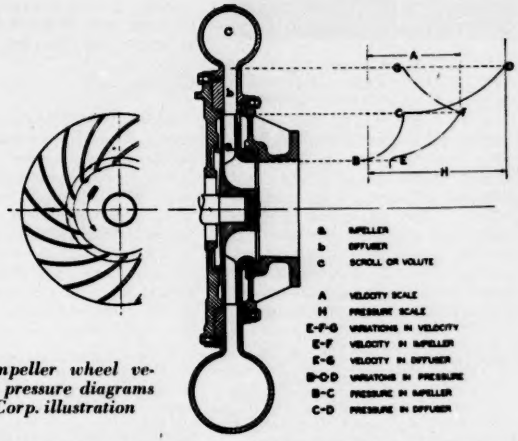


Fig. 4—Impeller wheel velocity and pressure diagrams —York Corp. illustration

The head produced by a centrifugal pump or compressor when operating at a given speed when expressed in feet elevation (h) is the same for all fluids, but when expressed in terms of lb per sq in. pressure (p) is inversely proportional to the specific volumes of the fluids, or is directly proportional to the specific weights (densities) of the fluids.

Entrance Velocity Not Important

Equation 3 can be simplified by neglecting the initial velocity V_1 without appreciably affecting the head. Entrance velocities are seldom higher than 50 ft per sec. (3000 ft per min) and in fans or blowers are often less than 2 ft per sec. Final velocities range from 500 to 700 ft per sec. If the initial velocity in Example 2 were neglected entirely the value of h would be 1555 feet instead of 1514, making an error of only 2.7 percent. For this reason the formula for head in feet, h, will be given as

$$h = \frac{V_2^2}{g} \qquad \text{(Eq. 4)}$$

Ingersoll-Rand Single Stage Blower

A single-stage centrifugal blower shown in Fig. 3 will be used to illustrate the operation of a centrifugal compressor. It consists of an impeller (1) supported by a shaft, and surrounded by a diffuser (4) with a suitable casing (5). The impeller by centrifugal force sucks in the air through the inlet nozzle (2) and discharges it at the outer circumference of the impeller at an increased pressure and velocity. The energy imparted to the gas to increase its pressure is called mechanical potential energy. That which was imparted to the gas to increase its velocity is kinetic energy. The velocity of the air leaving the impeller is slightly less than the peripheral velocity or tip speed of the impeller. After leaving the impeller the air passes through the diffuser and outer casing which are so designed as to gradually reduce the velocity of the air to its original inlet velocity. In this way the kinetic energy of the gas is recovered in the form of increased pressure.

About one-half of the total head is produced in the impeller and the other half in the diffuser and casing.

Pressure-Velocity Relation

The relation of the impeller wheel velocity to the gas pressure is illustrated very clearly in Fig. 4 which was furnished by G. R. Wachter of the York Corporation, and published in the June 1946 issue of ICE AND REFRIGERATION.

Tip Speed and Gas Velocity

The speed of the impeller wheel at its periphery is known as its tip speed, and may be computed from the equation:

$$V_t = \frac{3.14\ DN}{60} \qquad \text{(Eq. 5)}$$

V_t = tip speed of impeller in ft per sec.

D = diameter of wheel in feet.

N = rotative speed, rpm.

A wheel having a diameter of 18 inches turning 9800 rpm will have a tip speed of 772 ft per sec.

Tip speeds are limited to about 850 ft per sec. Rotative speeds range from 3600 to 10,000 rpm, the latter being the present limit for direct connection to gas or steam turbines.

NAPRE Department

Clark Brothers Company, Inc. of Olean, New York, in a bulletin on Centrifugal Vapor Compression Utilizing Hydrocarbons as Refrigerants submits data on four models with impeller diameters of 18, 22, 32 and 42½ in. and rotative speeds of 9800, 7350, 5500 and 4150 rpm, respectively. See Table 1. The tip speeds of these models are approximately 772 ft per sec. The maximum gas displacements of these models in cfm at intake conditions are given as 7000, 18,000, 32,000 and 60,000, requiring maximum shaft horsepower of 7000, 10,000, 15,000 and 22,000.

These data give us some idea of the huge displacements and power requirements of centrifugal compressors used in the petroleum industry.

Table I—Multi-Stage Centrifugal Compressors—Standard Sizes

Model	No. 2 Compressor				No. 3 Compressor			No. 4 Compressor			No. 5 Com'pr.	
Stages	3	4	5	6	3	4	5	3	4	5	3	4
Capacity—cfm—Approx. maximum	7000	7000	7000	6000	18000	18000	14000	32000	32000	25000	60000	60000
Capacity—cfm—Approx. minimum	2000	2000	2000	1700	6000	6000	4500	12000	12000	9500	24000	24000
Total weight—Lbs.	7400	7950	8500	9050	13400	15000	16600	23500	27000	30300	48000	55000
Normal speed—rpm	9800	9800	9800	8300	7350	7350	5700	5500	5500	4300	4150	4150
Suction opening—Dia. In.			12			20			30			36
Discharge opening—Dia. In.			8			14			20			24
Impeller—Dia. In.			18			24			32			42½
Intake press—psig			150			100			80			60
Discharge press—psig			300			200			150			110
Max. shaft horsepower			7000			10000			15000			22000

Gas Velocity

The velocity of the gas leaving the impeller is equal to the tip speed of the wheel multiplied by a pressure coefficient which will vary with the loading on a given impeller and with its blade angle. Pressure coefficients range from .5 to .7. An average value of .53 is used for the compressors listed above.

It has been established by Equation 4 that the head, h, against which the intake gas will be delivered is equal to the square of its velocity divided by 32.2.

$$h = \frac{V_t^2}{32.2}$$

Since the gas velocity is equal to the pressure coefficient multiplied by the tip velocity V_t of the wheel, we derive the equation that the head in feet in terms of tip velocity is equal to

$$h = \frac{cV_t^2}{32.2} \qquad \text{(Eq. 6)}$$

c = pressure coefficient

V_t = tip speed in ft per sec.

A tip speed of 772 ft per sec. with a pressure coefficient of .53 would result in a head of 980 feet, and a gas velocity of 410 ft per sec.

Staging

Each impeller lifts the gas a certain height or develops a certain pressure, therefore each impeller is a "stage" in the process of producing an overall head. The theoretical head required to compress one pound of saturated ammonia from 19.6 psig to 154.5 psig is 77,800 feet. If the head produced by each impeller is 9800 feet it would require 8 impellers or 8 stages to do the job. The number of stages does not depend upon the capacity of the compressor but upon the pressure range through which it must operate.

Work

Up to this point all of the discussion has been to develop the idea of pump head and to explain how it is produced. We will now discuss work and power in relation to the head.

Work involves the weight of the material moved in addition to the head through which it is moved. If the weight of the material is given in pounds, w, and the head in feet, h, the work done is in foot-pounds (ft.-lbs.) and is expressed by the equation

Work=hw foot-pounds (Eq. 7)

Work is one form of energy. The energy required to raise 2000 pounds of gas against a 100 foot head is exactly the same as that required to elevate a ton of ice through a vertical distance of 100 feet, or to lift ten tons to a height of ten feet. In all cases the work energy utilized is 200,000 foot pounds, and is the same whether it is done in one hour or in one week. The element of time does not enter into a definition of work nor into the foot pounds of energy utilized.

It can also be proven that work in foot-pound units can be converted into pressure-volume units as given in Equations 8 and 9.

Work in foot pounds=PV (Eq.8)

P is pressure in lbs. per sq. ft.

V is the volume pumped in cu. ft.

Work in foot pounds=144 pwv (Eq. 9)

p is the pressure in lbs. per sq. in.

w is the weight in lbs.

v is the specific volume in cu. ft. per lb.

There is another concept of work which does not imply lifting a body through a certain height. Work is the product of force and distance.

Work=F × D (Eq. 10)

F=Force applied to move the body in any direction

D=distance through which it is moved in the direction of the force.

If the force, F, is given in pounds and the distance, D, is given in feet, the work units will be in foot-lbs as in the previous equations.

Power

If work is done in a specified time it is no longer defined as work but power. Power is the time rate of doing work, and is usually expressed in (a) foot-pounds per min., (b) foot-pounds per sec., or (c) horsepower.

1 horse power=1,980,000 ft-lbs per hr.

1 horse power=33,000 ft-lbs per min.

1 horse power=550 ft-lbs per sec.

$$hp = \frac{\text{w per hour} \times h}{1{,}980{,}000} \qquad \text{(Eq. 11)}$$

$$hp = \frac{\text{w per min} \times h}{33{,}000} \qquad \text{(Eq. 12)}$$

$$hp = \frac{\text{w per sec} \times h}{550} \qquad \text{(Eq. 13)}$$

Under work we stated that 2000 pounds lifted through a height of 100 feet required 200,000 ft lbs of work energy. If this work were accomplished in one minute the result would give 200,000 ft lbs per min of power.

The horsepower required in the above illustration is found by using Eq. 12.

$$hp = \frac{2000 \times 100}{33{,}000} = 6.06$$

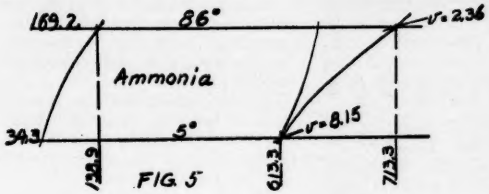


FIG. 5

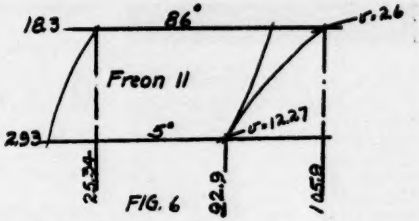


FIG. 6

Figs. 5 and 6—Pressure enthalpy charts

If the same work were accomplished in 10 seconds the horse power is found by using Eq. 13

$$hp = \frac{2000 \times 100}{10 \times 550} = 36.36$$

Area of Impeller Outlet

The area of the opening through which a fluid flows at specified rate by volume determines the velocity of

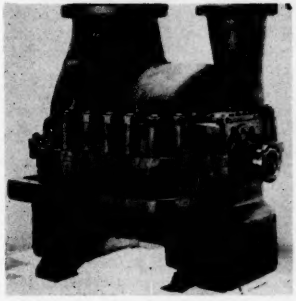


Fig. 7—Carrier centrifugal ammonia compressor

the fluid and likewise the head to be obtained. The relationship between rate of flow by volume, the velocity of the fluid, and the cross-sectional area is expressed by the equation

$Q = AV = 144\ aV$ (Eq. 14)

Q = volume in c.f.m.

A = area in sq. ft.

a = area in sq. in.

V = velocity in ft. per min.

Therefore $A = \frac{Q}{V}$ and $a = \frac{Q}{144V}$

As stated earlier present practice in the design of centrifugal compressors recommends that the exit gas volume of the final stage impeller should not be less than 400 cfm. With this as a minimum it would be interesting to compare some of the design features of a compressor using ammonia with one using Freon 11. This comparison will be made with both compressors operating on a theoretical cycle with 5 F evaporating temperature and 86 F condensing temperature. This cycle and the data needed to make the comparison will be shown on Pressure-Enthalpy charts. See Fig. 5 and Fig. 6.

Refrigerating engineers are accustomed to using Pressure-Enthalpy charts of refrigerants for solving problems involving tons capacity, cfm displacement, theoretical horse power, etc., on reciprocating compressors. They are equally useful when applied to centrifugal compressors. Fortunately they are available for most of the refrigerants in use for ice making, cold storage and air conditioning including ammonia, carbon-dioxide, methyl chloride, sulphur dioxide, the several Carrenes, and the Freons, as well as for most of the hydro-carbon gases such as methane, ethylene, ethane, propylene, propane, iso-butane, and butane. All of these may be found in the current A.S.R.E. Data Book.

From the two diagrams we note that at the end of compression the specific volume of the ammonia gas is 2.36 cu ft per lb, and of the Freon 11 it is 2.6. Therefore the weight rate of flow equal to 400 cfm will be 169 lbs per min for the ammonia and 154 for the Freon 11. (See Eq. 1).

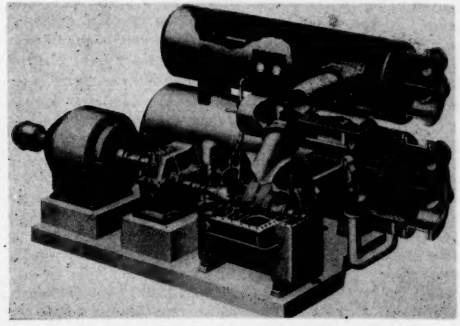


Fig. 8 — York Corporation centrifugal compressor system

The capacity of the ammonia will be 169 (613.3-138.9) / 200 = 401 tons and for the Freon 11 it will be 154 (92.9-25.34)/200=52 tons.

Other data is tabulated below.

	NH_3	Freon 11
Work of compression in Btu per lb.	100	13
Work of compression in ft-lb. per lb	77,800	10,114
Total head required in feet	77,800	10,114
No. of impellers (assumed)	8	1
Head in feet per impeller	9,725	10,114
Tip speed of impeller (assumed)	770	770
Average pressure coefficient	.53	.55
Theoretical hp	399	47.3
Theoretical hp per ton	.995	.910
Area of final impeller exit, a, sq. in.	2.34	2.27

Observations from Above Results

The ammonia compressor requires 8 wheels as compared with 1 for the Freon 11. It would not make any difference in the number of stages required whether 1 or 169 lbs. per min, is circulated. The number of stages depends entirely upon the total head against which the gas is delivered, and the head produced by each impeller.

The delivery area for the 401 ton ammonia machine is almost as great as that required for the 52 ton Freon compressor. It is equal to the area of a circle 1.73 inches in diameter—not very large for such a compressor. If the compressor capacity were cut down to 10 tons the area would be only .0583 sq inches, equal to the area of a circle .272 inches in diameter. The discharge area for a 10 ton Freon 11 compressor would be .436 sq in., equal to the area of a circle .746 inches in diameter.

Conclusions

It has been my purpose in this discussion to acquaint our members

with the uses of centrifugal compressors and to fill in a background of a few basic principles of design which have heretofore been neglected. Centrifugal compressors have many advantages especially in large tonnages. Because of their high rotative speeds which range from 3600 to 10,000 rpm they are readily direct-connected to electric motors and to steam or gas turbines and occupy relatively small floor space. They may be used with extremely low temperature refrigerants without experiencing oil

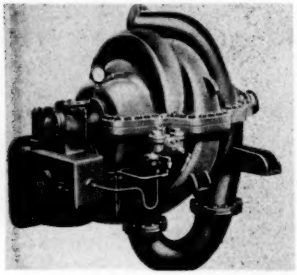


Fig. 9—Exterior view of Worthington 3-stage volute centrifugal compressor

troubles. Multi-staging and intercooling are easily accomplished, thus assuring economical operation. Large capacities are obtainable in single units. When a secondary refrigerant is to be cooled such as water or brine all of the major equipment including motor, compressor, condenser, cooler, refrigerant and motor controls may be assembled into a compact unit, thereby eliminating the pressure drops incident to long suction and discharge lines.

Figures 7 to 9 show various views of well-known centrifugal compressors. The writer wishes to thank the manufacturers who have so generously furnished him with photographs and written material used in this manuscript.

Fighting Fires

Class A: General—wood, paper, rubbish cloth. Use water or soda-acid extinguisher.

Class B: Burning liquids, oil paint. Use dry chemical, foam, carbon dioxide.

Class C: Electric equipment and systems. Use carbon tet, carbon dioxide, dry chemical.

N A P R E Question Box

H. G. Venemann, Professor of Refrigeration, Purdue University and chairman of NAPRE Educational Committee, answers members operating problems monthly in this column. Send questions to Chairman H. G. Venemann c/o Purdue University, West Lafayette, Indiana.

Relief Valve Piping

Question No. 883: In some cases I have seen safety relief valves on receivers and condensers which have no outlet piping. In other words any refrigerant released will blow directly into the air from the valve outlet. The Safety Code directs that discharge from relief devices shall be piped to the outside of the building. Where the relief valve is outside the building, would it not be desirable to attach a discharge pipe to protect people standing near the valve?—J. R. L.

ANSWER: The safety code directs that discharge from relief devices shall be vented to the outside of the building in an "approved manner". Nothing is said as to what would be considered as an "approved manner". It also provides an alternate whereby in certain cases ammonia may be discharged into a tank of water containing at least one gallon of fresh water for each pound of ammonia in the system. But for venting outside of building the public should be protected. Certain State codes provide that the vent pipe shall extend upward at least ten feet above all adjoining buildings.—H.G.V.

Protection for Relief Valves

Question No. 884: There is another angle to discharge piping from relief valves. Where they are outside the building they would be subject to dirt and corrosion on internal parts if not provided with discharge piping. This is also true if the piping is not properly arranged because rain or condensation could collect in the pipe and run into the valve. Of course rain entry can be prevented by turning the end of the pipe down but what measures can be used to prevent condensation of moisture in the pipe? While we are on the problem, I would also like to know if anyone has developed a set-up that gives an easily noticeable indication when the relief valve leaks.—J. R. L.

ANSWER: Numerous suggestions have been made from time to time concerning protection to the discharge pipe from ammonia relief valves, such as:

(1) Use galvanized iron pipe to prevent corrosion. While not advocated for general usage with ammonia, it would be satisfactory for this particular purpose.

(2) Put oil in the relief discharge pipe. If this is done the size of the pipe should be increased sufficiently to conform with the codes provision as to pressure head on the valve.

(3) Where the outlet must be upward a goose neck at the top of the pipe filled with oil could be used to prevent corrosion. It must be inspected periodically because the oil will get away.

(4) A thin gasket between companion flanges at the top of the discharge pipe will prevent water and moisture from entering, but would also burst if a leak occurs in the valve.

(5) A water-proof cap of rubber or plastic material similar to those used in the home will keep out rain or dirt.

Note: If anyone has other ideas we would be pleased to publish them. Also, if any one has developed a set-up to give an easily noticeable indication of relief valve leakage, please send it in. I suggest the use of a bottle filled with hydro-chloric acid containing a small quantity of alizarin indicator. A ⅛ inch pipe leading from the discharge pipe into the acid will conduct the ammonia gas if a leak appears. The acid is slightly yellow, but when neutralized by the ammonia, the color will change to a deep purple because of the alizarin. —H.G.V.

Machine Guards

Question No. 885: Last month there were photos of machine guards which were considered good. Is there any standard by which a machine guard can be judged to determine whether it is adequate? Or can you give me some of the basic requirements which a good guard should fulfill?—O. W. C.

ANSWER: Legal minimum requirements are fixed by state laws. However, many engineers believe a national statute should be enacted to cover interstate shipments.

Legal requirements are often set up as "General" and often do not adequately cover certain hazardous installations.

A guard should:

1.—Make contact to moving parts impossible except by unlocking or

unbolting, unless guarding barrier is at least 15 inches from the moving part.

2.—Where screen (close guarding) is employed, the guard must be sufficiently strong to withstand at least 150 lb. thrust at any point without permanent deformation.

3.—Close guards should be sectional and easily dismantled by unbolting to encourage immediate replacement after removal for repairs etc.

4.—All guards should have floor toe boards to prevent objects rolling under fly wheels.

5.—Close guards using mesh should be of small enough mesh opening that will prevent touching moving parts by fingers poked thru mesh.

6.—Rail guards should be 1¼ inch pipe or larger—minimum height 42 in. to top rail and should have one intermediate guard rail.

7.—Any guarding of Cubers or scoring machines should be close guarded with 24 volt interlocking circuit at each removable panel; to prevent all operation unless all guards are in place.

8.—All automatic operating units should have signs attached advising "Pull disconnect switch before oiling or adjusting".—HARRY HOLBROOK

New Questions

Balanced Brine System

Question No. 886: In our cold storage plant we have a balanced brine refrigeration system that serves parts of several floors. Because of certain changes we are making, it would be much more convenient to operate the rooms at the front and back of the building on separate brine risers and returns.

Would it be equally satisfactory to use the present balance tank on the rear section and install a new balance tank at the same level above the front section? With this arrangement the two cold brine risers would connect to the brine cooler discharge in the basement. The two brine return lines would come together in the basement at the suction connection to the brine pump.

In other words can two balanced brine circulating systems with the two balance tanks on the same level operate satisfactorily when tied together in the basement at the pump suction and the brine cooler discharge?—C.A.C.

Lightning Protection

Question No. 887: In recent years most plant engineers have given little thought to protecting their electrical equipment from damage by lightning. The utility power lines are protected and ordinarily this also protects the customer's equipment.

From a fundamental standpoint, however, is this protection sufficient or should the individual plant in some cases have its own lightning protection equipment installed?—A.L.

Ice Cream Freezer Operation

Question No. 888: It is not considered a good idea to precool the liquid ammonia fed to an ice cream freezer because the flash gas is required to agitate the refrigerant in the shell of the freezer. In our plant it also appears that the pressure feeding the liquid to the freezer (condensing pressure) must be up fairly high to permit best output by the freezer. Could this be a special condition in our plant or do certain freezers have a minimum liquid ammonia pressure below which operation is unsatisfactory?—M.L.P.

NAPRE Department

News Notes and Chapter Activities

St. Louis

By K. M. HOLADAY

A REVIEW of the latest developments in water technology was given April 16, by William J. Wright, former Chapter Secretary. Speaking at the regular chapter meeting in the Kingsway Hotel, Bill summarized the water treatment papers presented by various authorities at the recent Midwest Power Show in Chicago. The subject stimulated many questions from the floor.

Collins Posey wanted to know "Why is soft water more corrosive than city water?" Bill pointed out that a relatively hard water generally lays down a coating of calcium carbonate which tends to protect the metal from the corrosive action of dissolved oxygen.

Speaking of corrosion, Bill mentioned a problem recently encountered where the short vertical section of pipe at the end of a condensate return line entering the top of a feedwater heater had to be replaced every few months. Charlie Bergmann told of correcting a similar condition in a brewery boiler room by replacing the corroded section with brass pipe. Lester Lanser reported very good results on the same kind of problem in his dairy boiler room where he had installed an air trap at the top of the vertical pipe entering the heater.

Les Fleiter wanted to know how to avoid corrosion in small plants where boilers, condensers, and such equipment may be laid up for the winter season. Charlie Bergmann had two answers for this one. One way is to drain the equipment and apply a thin coating of Apexior (a specially processed paint-like material). Where boilers are equipped with continuous blow-down, and at least one unit is kept in operation throughout the year, the idle boilers can be protected by connecting the continuous blow-down to run through the idle units and overflow from a vent out of the top of the drum. This keeps the idle equipment warm to protect it from atmospheric condensation and rust. It also keeps the unit full of alkaline boiler water and eliminates the pitting which would occur at the water line in vessels standing idle with an air space above the water.

It was also suggested that idle condensers can be protected by keeping them full of water with about 500 parts per million of chromate added (equivalent to 6 lb. sodium dichromate per 1000 gallons).

In a brief business session, President Fleiter called for committee reports. Don Watkins summarized the program of the Midwest Regional Conference sponsored by the Chapter March 31, and reported very favorable results from the standpoint of membership interest compared to expenses incurred.

Bill Emig's report for the Nominating Committee was unanimously adopted. Ballots are to be mailed to the members and the election of the new officers will be announced at the May meeting of the Chapter.

New Orleans

By LEO VIVIEN

THE meetings in April showed a marked improvement in attendance. This was probably caused by the quality of the programs produced by Educational Chairman Chase, and by President Howat, instituting a telephone reminder just prior to the meeting date.

At the April 11 meeting B. Mancuso, supervising engineer of the Pelican Ice and Cold Storage Company, delivered a lecture on "Methods of Preparing to Charge a New Plant", and "The Safe Handling of the Refrigerant". Mr. Mancuso elaborated on the methods of testing the evaporators, condensers, receivers with air pressure, and testing for leaks. He also explained how to evacuate the system of air before admitting the refrigerant. He then charged the refrigerant into the system, explaining in detail the safe and proper procedure. Since this subject was so practical, many interesting questions were asked and the discussion was quite lively.

The month of April having been designated nationally as Safety Month, the Chapter devoted the entire meeting of April 25 to discussions

of safety in refrigerating plants. Mr. Finger, engineer with the Safety Department of the Maryland Casualty Co., was the featured speaker. Mr. Finger showed pictures taken of various hazards and unsafe practices in refrigerating plants, and the use and importance of gas masks in the plants. Numerous unsafe practices were discussed, such as preheating refrigerant cylinder to hasten charging; liquid carry-over, defrosting and pumping out systems; the necessity of responsible observance of automatic controls, and care necessary when applying an open flame in the vicinity of the Freon refrigerants.

The hazards involved in not permitting fresh air to enter air conditioned areas in places of public assembly were also discussed. It was evident from the discussion that the subject of safety should be handled and discussed more often.

Chicago

By E. B. Jones

THE chapter members and a number of guests enjoyed a trip to the Research Laboratories of the Association of American Railroads which are situated in their own building on the Illinois Tech Campus. This recently constructed building of quite modern design in itself had many features of interest.

Host for the event was Averill Cole who conducted the group through the laboratories. There were air conditioned rooms which could be maintained at most any desirable temperature and relative humidity. Elaborate equipment is installed to determine the durability of various types of shipping containers because the railroads are especially interested in having freight carried without damage. After inspecting some of the other departments the men were conducted through the refrigerator car testing section where Mr. Cole explained how tests are conducted in the laboratory on the various components of the cars and how the field checks are made. Numerous temperature measuring instruments were demonstrated along with sensitive relative humidity equipment and other appliances for checking performance of refrigerator cars.

The group assembled in the auditorium where the meeting was held and then Emerson Brandt presented an illustrated talk on the problems encountered in freezer room construction. It was based on the illustrations and notes supplied by Ed Nelson of Union Ice Co., as presented in his noteworthy talk at the 41st annual convention. A lively discussion followed in which a number of the attendants participated. Moisture problems especially came in for considerable attention. At the conclusion of the meeting the group enjoyed a social hour with an excellent luncheon.

The second meeting of the month was arranged as a quiz program and question box discussion. President Leslie Clifford had collected a number of good questions which created a lot of interest among those in attendance. Among those who participated rather extensively in the discussion were Douglas Benton, Fred Berk and Gene Rytlewski. Doug described a large condenser operation in which theoretical improvements to the water distributing system had not proved satisfactory in practice. Fred told about investigations of water distributors for vertical shell and tube condensers. More recent data he said had shown that the circulation of air through the tubes along with the water is a theoretical but not an actual benefit. Gene discussed automatic expansion valves and their proper application in systems.

Initiation was conducted for several new members. Those who joined the chapter recently are: Robert Howe, Perry Kawasaki, Frank Reschke, Orwin Benson, John McKinlay and Richard Howe. The meeting was concluded with a movie showing the operations of the Firestone Tire and Rubber Co., and a sport short.

Colton

By H. O. Bonter

IN LINE with the designation of April as safety month, Chris Hartford, State Safety Engineer, gave very interesting suggestions on how to guard ourselves against accidents, especially around machinery. He warned against taking safety guards off machines which had been done in a great many cases. Frequently it was declared that these guards were in the way of the workmen, but Mr. Hartford cautioned that management should insist on keeping the guards in place for the protection of everyone.

There is another very important factor involved. Mr. Hartford explained that an injury costs the state $3,750 and it should be kept in mind that if guards are left off machinery and a man is injured the compensation paid is only half of the amount it would have been had the guards been left in place.

A chapter was read from the book of General Industry Safety Orders to show the amount of refrigerant that could be used in certain sized rooms. He also discussed safety methods in handling refrigerants. This book can be purchased from the Department of Industrial Relations, Documents Section, 11th and O Street, Sacramento 14, Calif., at a moderate cost.

This was a double header meeting. After Mr. Hartford's talk H. N. Royden, Royden Ice Co., Los Angeles and his guests W. I. Meader, Double Seal Ring Co., and Rudi Kettler, Fairbanks, Morse Co., conducted a very interesting quiz. Questions and answers on the various types of piston rings were given. They had several of these on hand for display purposes to show the wear on them and questions were asked as to what made them wear in that particular way. Mr. Royden would ask the question and then either the group or Mr. Meador of Mr. Kettler would answer.

E. T. Quinn, past national president, V. A. Stubblefield and E. C. Hammersmith— all of Pacific Fruit Express Co., Los Angeles were also guests at the meeting. Mr. Quinn gave a talk on the operations of the NAPRE, the benefit the members get from it. He urged that members try to get all they can by regular attendance at meetings. He said membership more than pays for what little it costs. The group enjoyed the prize awards and the usual lunch.

Stockton-Modesto

By R. M. Edger

Along with many of the chapters we observed safety month with a film and discussion on the control of fires at our meeting held in Modesto. This film described how fires start and the various ways of controlling them. It was very interesting and the members got a considerable amount of good from it. Following the showing of the film the meeting turned into a general discussion of fire prevention and members of the chapter exchanged a number of practical safety ideas, all of which resulted in additional safety information.

Detroit

By L. L. Adams

We are sorry to report the death of Leonard C. MacNally. A member of the chapter for 14 years he had retired a few years ago and was living with his daughter, Mrs. Lois Goodreau at Beltsville, Md. But he still continued his membership and made visits for meetings now and then. We will miss this loyal member and good friend.

Minnesota

By George Gartner

FOLLOWING the regular business meeting Chairman Herb Gartner of the Educational Committee took over and introduced Lynn Krause, representative of the Penn Electric Switch Co., who gave an interesting talk on controls. One of special interest was their new twin contact control which eliminates use of the magnetic starter on motors smaller than two or three horsepower for 440 volts. The evening was concluded with a movie on Central America. At the same time refreshments were served.

In a carryover from the previous meeting there was additional discussion about available places to meet at a moderate cost. Information received about the present meeting place at Woodruff Hall had indicated that no lower rental was possible and that there might be an increase.

Investigation will be made of other locations.

The special speaker at the meeting was George Svoboda. The members commented that Mr. Svoboda's talk was most informative and interesting. However, due to Herb Gartner's becoming suddenly ill the secretary had to leave the meeting which was carried on by the members present.

Films were shown on the atom bomb and preventives and a tour to South America. Then an excellent lunch was served which included wieners, sauerkraut, chili and coffee. The meeting was well attended with one of the best turnouts we have had. We hope the members will continue in their efforts to make our meeting attendance good.

Rio Grande Valley

By Armin Doneis

New officers will serve the chapter during the year ahead:

President, G. C. Musch
Vice-president, A. F. Doneis
Secretary, Russell Sawyer
Treasurer, Calvin Burg
Sgt.-at-Arms, Henry Black
Directors: A. M. Casberg and Ollie Allbright

Instructor John Muller continued the discussion of condenser tube corrosion and the freezing of balls of ice around air tubes in clear ice manufacture, using the Question Box in the NAPRE section of Ice and Refrigeration as a springboard. Following the eductional section of the program there was a general discussion of association operations in the Board of Directors meeting. The discussion was concerned with the educational program, attendance and membership.

One of the members described the construction of several air conditioning systems in local churches which use ice as the refrigerating medium. The water chilled by ice is pumped through fin cooling coils over which the air circulates. He desired a discussion of effective means for controlling such a system.

Subsequently it was pointed out during the discussion that the temperature of the auditorium could be controlled by a thermostat-controlled by-pass valve which would allow part or most of the returning warm water to by-pass the ice tank and return through the pump back to the cooling coil, thereby reducing the delivered refrigerating effect. When the auditorium temperature rose slightly this by-pass valve would close and more cold water would be drawn from the ice tank and less warm tempering water would be bypassed to the pump for delivery to the cooling coil. In addition these systems control temperature and relative humidity of the air by means of allowing a varying portion of circulating air to by-pass the cooling coil and be remixed before it circulates to the supply outlets.

Instructor John Muller presented a number of possible topics for future study including air conditioning, design and operation of Freon-12 systems, dismantling and repair of small compressors, refrigerant controls and the use of magazine articles for question box and other discussion. At the close of the session it was announced by Mr. Muller that Ollie Allbright would bring a Freon-12 compressor to the next meeting where it would be dismantled and the repair methods would be demonstrated and discussed. This promises to be an excellent feature which will familiarize the membership with the operation, construction and repair of typical small Freon 12 units.

Memphis

By Charles Conley

THE subject of air conditioning, its applications and problems was discussed by W. L. Drake, chief engineer of Air Temperature, Inc. He used the blackboard to explain his talk and demonstrated typical calculations to figure a job. Also included in his talk were pointers on how to care for equipment and what to do to get the best results and efficiency from the plant.

The special speaker at the second meeting was Frank E. Conaway, designing Engineer for E. D. Goodfellow Co. Inc., manufacturers of cooling towers. He talked on the design and use of various types of cooling towers and their maintenance and operation. He said the section of the country has a lot to do with the type of tower chosen because the water available in different sections brings different types of maintenance problems. The best way to check tower operation he said, is to compare the temperature of the water coming off the tower with the wet bulb temperature.

Because water supplies are becoming short in various sections of the country, Mr. Conaway said that the use of cooling towers is increasing much more rapidly. At the same time he declared that this wider use of cooling towers is bringing its special problems in condenser design and construction. Manufacturers are finding it necessary to improve or change their condenser designs in order to permit larger volume circulation of water with reduced friction and pumping heads. One problem the manufacturers have not solved as yet is a screen that will keep out foreign matter that stops up air passages and spray nozzles.

Quite a lot of discussion was given to the subject of the national convention to be held in Memphis this year.

Tacoma

By C. W. E. Johnson

The feature of our meeting was a talk by Quaid Minich of Niagara Blower Co., who gave the chapter an interesting discussion on evaporative condensers and no frost evaporators. We recently welcomed Philip Gilmore of Tacoma to membership.

NAPRE Department

Los Angeles

By E. T. Quinn

THE field trip in which the chapter visited the water softening and filtration plant of the Metropolitan Water District proved most interesting. This is the world's largest softening and filtration plant. It has a daily capacity of 200 million gallons and provision has been made to increase it to 400 million gallons.

The water comes from the Colorado River supplied through a total of 242 miles of a large aqueduct. It contains 330 parts per million of hardness which principally is calcium bicarbonate, calcium sulphate and magnesium sulphate. The bicarbonate is removed by lime treatment and the calcium and magnesium sulphate are changed to sodium sulphate by zeolite treatment. A huge plant is required to handle such a large quantity of water and all of the equipment is of impressive size. There is also a well staffed laboratory to supervise treatment and investigate problems for the district.

In the operating cycle lime solution is mixed with the water flowing in from the aqueduct. Then it passes through the flocculating basins and into the clarifier or settling tanks. Here most of the calcium carbonate drops out and the remainder, along with any turbidity is moved in sand filters. The filtered water goes to the zeolite beds and finally it is chlorinated before passing into tthe distribution mains.

San Francisco

By Robert McKee

THE April meetings of the San Francisco Chapter were highlighted by the lecture classes presented by John Thompson of the San Francisco College. These classes are being well received by members and the Chapter has emphasized them since they offer a unique opportunity to obtain refrigeration instruction at a college level.

Mr. Thompson is using Professor H. G. Venemann's text for background and home study assignments and for many this controlled study is increasing the value of the book as it interprets many points and makes for better understanding.

At the first meeting the members enjoyed a showing of two excellent Pacific Gas and Electric Company films—"Super-Inch" and "Kilowatt-Builders". Both films covered subjects directly or indirectly affecting all our daily activities and were very interesting.

The second meeting was devoted to Chapter business, including financial reports, after the annual "Hi-Jinks" and plans for future meetings.

In an effort to increase contact and fellowship among officers, as well as all other members of the Chapter, as many as possible gather together for dinner before meetings. This get-together affords an opportunity for members to become better acquainted and to participate in preliminary discussions of Chapter problems.

Membership Contest Winners Reveal All

LOS ANGELES Chapter has made a habit of winning recent membership contests. They were requested to describe their successful methods for the assistance of others. This has been done in the following account by Ray Burnett which gives many useful ideas of wide application.

The first thing to do when starting a membership drive is to select a chairman. This fellow should be well known by all the members of his chapter. He should be willing and able to work; should always have a message to the boys; should make it brief but clear; should never miss a meeting and by all means should be able to make friends and influence people. Whatta man! I wish we had one here!

Assistants Needed

Next, the chairman must have several assistants. They are the boys who actually bring in new members year after year. Maybe they do not like to stand up in front of a group of men and talk, but they have a whole bag full of ideas which can be passed along by the chairman. These hard-working members should be picked from each large representative group in the club, i.e., in Los Angeles we have three outstanding bodies of men, the Union Ice Co., the California Consumers Corporation, and the Independents. With us it is a must that these three groups be represented.

The next step is to divide the chapter into two natural groups to create a bit of friendly rivalry. Here it is the Independents vs. the Union Ice, California Consumers Corporation. The losing team chairman always buys the winner a dinner at the close of the contest. You would be surprised how hard a high-priced engineer will work to avoid having to buy a $3.50 dinner. Try it, and observe the magic it creates.

Prizes

One of the all important musts in any sustained drive is something to work for, some prize or trophy that will have an immediate group appeal. Whatever it is going to be, it should be bought and exhibited at every meeting. Eye appeal is all important, otherwise show windows and signs would not exist. The prize should be as fine as the club treasury can afford. If a large expensive prize is offered, strings should be attached so that a small effort is not overpaid. Our chapter, for instance, makes it a prerequisite that a contestant bring in at least ten new members to qualify for first prize and five new members to qualify for second prize.

Each chapter should build its own pyramid of prizes. There are almost always a few generous members who will donate something without being asked if someone starts the ball to rolling, does a good job of selling the entire chapter, or pats the right fellow on the back at the right time. Another method of reviving interest in the drive is to award a prize for a spot run of a certain number of weeks. We have a spot prize for the man bringing in the most new members for the months of April and May regardless of his prior standing in the drive.

Every Member a Worker

Insist that each member bring in at least one new member. Drive that home. Almost all the men in a club can find one new man in a year if they try hard enough. Place a prize for that. Here is how we do it. At the close of the drive all those who have brought in one or more new members are given a cocktail on the house. All those who do not have at least one man to their credit are given a sniff of the cork. It's unbelievable how hard a man will work to avoid having to smell that cork in open meeting. Try it, pennants and placques have been won by this little trick.

In order to keep a good worker working we always have a prize for him for every five new members he brings in. We also have an extra prize for him over and above the second five if he gets one more. In other words, for eleven new members he gets three prizes. We believe it is good business to share the benefits. If there are any doubts about the above statement come out and take a look at our national pennants, placques, etc.

Individual Attention

Having a goodwill ambassador is a must if you wish to impress the prospective member, the guest or the new member. One of the most important duties of the sergeant-at-arms is to meet and greet every man who attends a meeting. He must see to it that he is properly seated, introduced and made to feel at home. Every old timer must always be a delegate of friendship and good fellowship. He must always shake hands with new members, prospects and guests. This must be followed up until the new member is made to feel that he is really one of the group.

The President must always welcome the new member, shake his hand and introduce him to the entire body. He must follow up by calling him on the 'phone or writing him a letter the next day telling him how glad he is that "Mr. John Doe" has now become a full fledged member of the N.A.P.R.E. The secretary is instructed by the chair to notify his employer that he is so enthusiastic about his work that he is attempting to learn more about it in his spare time by associating with an educational body of men such as ours.

During the regular meeting a five minute recess is declared so that every man present may turn around and greet the man behind him. Note that it is not the man beside him. Chances are a hundred to one he is sitting alongside his best friend. This method soon enables the new man to call quite a number of old timers by their right names instead of yes sir, no sir, or hi there!

Introduce New Member

Whenever it is at all possible, the new member should be picked up by his sponsor and brought to the meeting place. He should be told about the many advantages of belonging: The nightly class in refrigeration, the fine papers, the field trips, and the new refrigeration course which will be out shortly, are but a few of the fine things which the N. A. P. R. E. has to offer. The ability to call upon the finest brains in the industry for advice, a position or just plain social occasions is more than enough to repay any man ten times over for his small initial outlay and smaller annual fee. I know of no other place in the world where so much is offered for so little.

Never overlook the salesmen in the chapter. If they can sell merchandise, they can sell the N. A. P. R. E. Go after them, by all means put them on a committee. Remember they contact more people in an average week than the average engineer contacts in a year. If he is sold on the N. A. P. R. E., your membership drive is well on its way to success.

Invite the big bosses out to your meetings. Acquaint them with what we are doing. Once they are sold, you not only have the door open, you are in!

Remember our goal 5100 for "Howard" in '51. Paint a sign and hang it in your meeting hall. Let's not let it be a dream, let's make it a reality.

THE ICE INDUSTRY

NATIONAL ASSOCIATION OF ICE INDUSTRIES

Executive Offices
1706 L St. N. W., WASHINGTON 6, D. C.

Executive Secretary
GUY W. JACOBS, WASHINGTON, D. C.

President
H. O. MCLAIN, CHICAGO, ILL.

First Vice-president
E. F. CONDON, LOS ANGELES, CALIF.

Second Vice-president
WM. J. AYERS, MEMPHIS, TENN.

Treasurer
GEO. STEERS, JR., KALAMAZOO, MICH.

THIS MONTH IN BRIEF

A billboard poster, with a handsome ice service man in the center of interest will be displayed by the Gulf Oil Corporation in 34 states and the District of Columbia throughout the month of June.

A panel discussion at the annual convention of the California Association of Ice Industries brought out new markets for the sale of ice, including poultry cooling, for displays of fresh meat, and for beer cooling.

The annual convention of the New England Ice Association was held April 11 and 12. Panel discussions brought out much information on vending machines, engineering subjects, and merchandising.

The Spring ice conference of the Canadian Association of Ice Industries was held April 10 at Brantford. Formal talks and discussions centered on building better business.

A merchandising forum was held by the Florida Ice Manufacturers Association May 3 at Panama Coty. Merchandising and salesmanship were discussed by speakers and panels.

The annual meeting of the Unit Ice Association Secretaries was held in Washington April 26-28. Reports were made by representatives of the National Association and general discussions were held.

Ice Service Man Highlights 3500 Billboard Posters

Here is another example of the effectiveness of concerted ice industry effort when exerted through the National Association of Ice Industries. The Gulf Oil Corp. will display 3500 of these posters throughout the month of June in 34 states and the District of Columbia.

ABOVE is a miniature reproduction of a poster which will appear in full color on billboards in 34 states and the District of Columbia throughout the month of June. Approximately 3,500 boards will carry this handsome illustration. This attractive advertisement by the Gulf Oil Corporation will do an outstanding service for the ice industry. Because it is the direct result of action by the National Association, all ice men will be interested in the background story, as told by the Public Relations Department.

Last July the Gulf Oil Corporation displayed on its billboards a poster featuring a rather unkempt-looking iceman. While there was definitely no malicious intent on the part of Gulf, it was felt that modern ice service was seriously misrepresented in this illustration. Letters of protest from many ice companies showed that the industry generally agreed.

Neat Ice Service Man More Typical

The National Ice Association registered an objection through Donahue & Coe, the agency which places national ice advertising. With the agency's assistance, it was carefully explained to the Gulf advertising manager that a neat, smartly-uniformed serviceman, carrying the ice in a drip-proof bag, would have been far more typical. The advertising manager soon accepted and concurred in this point of view. From the start he showed a sincere desire to make amends for the unintentional slight to the ice industry.

An immediate result was that Gulf offered to interview on their "We The People" television show some iceman who had performed a heroic deed. Though a suitable instance has yet to be found, this offer is still open. Later, on this program, a commercial skit was carried featuring an iceman whose uniform and equipment was ideal. The iceman brought the announcer a block of ice with a can of Gulf oil frozen inside. To make certain that every detail was in order, Gulf checked this commercial beforehand with Donahue & Coe.

This poster will be another follow-up. Displayed on 3,500 billboards, it will be seen by millions of people. The Gulf Oil Corporation has been quite cooperative doing its utmost to offset damage done by the previous poster.

The Ice Industry

Canadian Committee Merchandises Sized Ice

NEWLY appointed chairman of the Sized Ice Committee of the Canadian Association of Ice Industries is D. E. Johnston, sales manager of the Lake Simcoe Ice & Fuel Ltd., Toronto. First meeting of this group was held in the Association office April 2 at which far-reaching plans were laid for the development and promotion of sized ice for vegetable, poultry, fish displays, and for domestic consumption.

As ice dealers in some areas are not fully informed or aware of the vast potential in sized ice merchandising, it was decided to prepare literature outlining the advantages of sized ice in the retail food markets. Photographs of actual Canadian installations will be reproduced and also diagrams for the building or conversion of display cases. Material developed by the National Association of Ice Industries also will be used.

Many ice dealers in Canada are doing a growing and increasingly profitable business in sized ice, and the only reason that many more are not getting in on this business is that sufficient local work has not been done. Using the Association material on a planned program, the local ice dealer cannot help but create interest and obtain new and permanent ice customers.

Wage Stabilization Orders Affecting Ice Industry

A BULLETIN summarizing wage and salary stabilization regulations as they affect the ice industry has been issued by the National Association of Ice Industries. Any discussion of this question however, it is stated, must be qualified by the fact that these regulations are still in a formative stage.

Under the Defense Production Act of 1950, the general ceiling price regulation effective January 25, 1951 freezes all prices in effect during December 19 to January 25 and all wages and salaries prevailing on January 25. Since then there have been ten general wage regulations to meet certain wage and salary problems. For those having bearing on the ice industry, the following brief reviews are given:

Regulation No. 5 permits certain individual increases based on contract or written policy, or mutual understanding or established precedent. Under this regulation, increases are allowed for merit, length of service, promotions and transfers, new or changed jobs, and variations in earnings.

Regulation No. 6 permits wage and salary increases to catch up with increases in the current cost of living, this being limited to about a 10 per cent increase. No application is necessary in seeking approval of increases but every employer who grants wage increases pursuant to this regulation must file the original and two copies of Form "WS-6a" with his nearest Wage-Hour field office.

ECA Award to National Association of Ice Industries

A CERTIFICATE of Cooperation from the Economic Cooperation Association is being accepted by Guy W. Jacobs, executive secretary of the National Association of Ice Industries from William H. Press, executive secretary of the Washington Board of Trade at the Hotel Statler. The citation reads: ". . . for furnishing technical assistance to the Peoples of the Marshall Plan Countries to aid them in maintaining individual liberty, free institutions and peace." The certificate is signed by William C. Foster,

Administrator of the Economic Cooperation Administration. The ceremony took place at a recent annual "awards meeting" of the Washington, D. C. Board of Trade.

Shelbyville Ice Company Purchased by Lusk Corp.

THE business of the Daniel DePrez Manufacturing Co., Shelbyville, Ind., has been purchased by a new corporation headed by Leland Lusk. The new corporation will be known as the DePrez Ice & Fuel Co. Mr. Lusk, principal stockholder of the new firm, has been manager of the Lusk Corp. since 1943.

The DePrez ice business has been operating in Shelbyville for more than 50 years. Founded by Daniel DePrez, it was one of the first ice businesses in Indiana. It also operated a large coal yard and its ice routes extended over all of Shelbyville County and into adjoining counties. The plant was completely rebuilt in 1945 making it one of the best equipped of its kind in the state. Founded by Mr. DePrez in 1903, the business has remained in the same family. Following the death of Herbert DePrez in 1935, the business has been directed by his son, John C. DePrez. The new company will continue the same high standards of service.

City Products Earnings

BOTH sales and net profits of City Products Corp. so far this year are in line with the like 1950 period, William J. Sinek, president, said following the annual meeting held in Cleveland, April 20. For the first half of 1950 net income was equal to $1.60 a share on the capital stock. The company is contemplating further diversification of its products, but did not disclose in what direction.

Mr. Sinek attributed the drop in new income last year to abnormal weather, crop failures and strikes which curtailed revenue from sources ordinarily productive.

Stockholders approved an amendment to the certificate of incorporation to provide for appointment of two executive vice presidents instead of one, and to reduce the number of directors from eighteen to fifteen.

Evansville Ice Company Buys Two Other Firms

ICE Service, Inc., leading ice industry of Evansville, Ind., has purchased the ice interests of two other local firms, Service Ice Co., and Tucker & Sons. Ice Service, Inc., owned three ice plants and has ten vending stations located throughout the city. The two newly purchased plants will no longer sell ice. Their customers will continue to be served by the purchasing company.

FINDING NEW MARKETS FOR ICE

New markets for the use of ice continue as an important phase of new ideas on ice merchandising, as brought out in a panel discussion at the California Ice Convention

ONE of the interesting features of the California ice convention was a panel discussion on new markets for the use of ice. Among those covered were beer cooling, poultry icing, and in fresh meat display counters. A. L. Robertson, Union Ice Co., Hayward, Calif., moderator of the discussion said that the best kept secret of the world today is not the atom bomb, but the benefits to be derived from ice refrigeration. The speakers in the panel discussion which followed, he said, had been given the assignment of revealing these secrets where it would do the most good—to probable ice customers.

Selling Ice for Poultry Cooling

L. J. FITZPATRICK
Central California Ice Co.
Fresno, Calif.

THE poultry industry has shown a considerable interest in the use of ice for the chilling and displaying of their product. A great deal of money has been put to work by that industry in advocating the use of ice for such purpose through such mediums as beautiful ads in our national magazines, radio programs, local newspaper ads, plus the excellent job being done by thousands of salesmen and women employed by that industry and indirectly selling ice in conjunction with the merchandising of poultry.

We began early this year with a small portable demonstration unit. It was made of a 55 gallon wooden barrel, a half inch length of galvanized pipe and a length of air hose. A small air compressor was used to develop a steady three pounds pressure through perforations in one end of the pipe so as to agitate the water ice slush which does the cooling job.

We have used this unit a great many times in demonstrating to poultry processors, small and large, convincing them that ice is the proper, quicker, easier way to chill poultry. We have also participated in retail grocers food shows by displaying poultry on ice to thousands of housewives and hundreds of grocers.

We found this method effective in convincing many dubious grocers of the fact that you can display poultry on ice for a period of several days and have it fresh and firm. One particular show ran for a period of five days and the salesmen used the same display of poultry for the entire show. On the final day the dressed birds were removed from the ice and handed to grocers so they could feel and see their good condition. This demonstration did a wonderful job. As a result of this work we opened up a new market for about 7,500 tons of ice in a two hundred mile strip in the Valley.

Three Important Factors

Now transposing this into a common denominator of our retail delivery, we find that we have sold 15,000,000 pounds of ice, enough to support the addition of fifteen retail delivery routes. These new customers do not buy ice because they like the looks of us here in the ice industry, but rather because they are interested in the control of three important factors from the time the birds have been dispatched until they are marketed. These factors are temperature, time and quality. Every poultry man is worried about the reduction of temperature, the amount of time he has, and the quality he finds in his bird when he goes to sell it.

Ice provides the answer to these three factors. I think it is essential that all of us become thoroughly familiar with each. It is important that the temperature of freshly killed poultry be reduced from approximately 106 degrees to 36 degrees as rapidly as possible. This can be accomplished by immersing the birds in a water iced slush and agitating the mixture with the introduction of low pressure air and to prove it by taking internal temperatures with a poultry thermometer.

A cooling room requires from 12 to 24 hours to properly chill dressed poultry. Compare that with one and a half to three hours required by the ice method. The slower method is a disadvantage to the poultry man. It slows up his marketing, he can't ship the poultry on the day it is killed. But if he uses the ice method he can gain an entire day, which is very important to him, and the consumer receives a fresher bird.

By doing a more rapid job of removing the heat, better quality is assured, and the appearance of the bird is enhanced. The ice method brings out that fresh bloom every poultry man is looking for on a finished bird. One fairly large processor down our way told us recently that his grading has been up ten percent since he began using the ice method. That meant a lot of dollars in his pocket.

As far as cost of operation is concerned, our customers tell us the costs are relatively the same. It is natural. However, we know that we have helped many small processors to reduce those costs. They have found for instance that the same employees can do the killing operations and also serve as salesmen in front by killing birds on normally slow days, and concentrate on serving customers on their busy days.

Convincing a Prospect

We have found some dealers, both retailers and processors, who after watching our demonstration or looking at a beautiful ice display, are still not sold on ice. They say their customers won't pay any more for a better quality, and they don't think they could increase their sales. In such a case, the dealer just isn't a prospective user of ice. Probably we missed something. Maybe we weren't enthusiastic enough. However, before we

leave that customer we can begin to talk to him about the shrinkage, ask him what percentage of shrinkage he is experiencing and we can tell him that ice can prevent that dehydration loss. He generally will be interested again.

Early this year I talked to a very prominent old-time poultry man. He said that some twenty years ago a great deal of poultry was chilled with ice and the only thing he could see that was different was that they hadn't thought of any means of agitating the mixture of water and ice which is the secret of rapid chilling. For that reason, or possibly because the ice industry wasn't particularly interested in poultry chilling at the time, they stopped buying ice and the ice industry has lost a lot of tonnage over those years. Our company has many good friends and customers in the poultry industry and we are interested, as I think other ice men should be, in becoming better acquainted with this line of business and the new market it has opened up.

Displaying Fresh Meat with Ice

R. W. DAVIS
Union Ice Co.
San Francisco, Calif.

WE have experimented with the displaying of meat in connection with ice and we find that ice by itself is an expensive job in the average display case. But tie ice with mechanical refrigeration, and we find an entirely different picture and tremendous opportunities for the sale of additional ice.

Many years ago the meat shops in Syracuse, N. Y. began displaying their meats on a bed of crushed ice. About a year ago on my way to the National Ice Convention I stopped at Syracuse to talk to H. D. Sanford of the Peoples Ice Co.

Mr. Sanford met me at the train and took me on a tour. We went into the biggest markets in town and the smallest showcase that I saw on that trip was 70 feet, the largest 140 feet, and every foot had a bed of crushed ice in it, in connection with refrigerated coils running along the back of the case. I never talked to people in my life who were more enthused over the method they were using, than the owners of those stores.

I was in one store which has 80 feet of showcase. People were lined up three deep trying to buy meat. Behind that 80 feet of case were fourteen butchers waiting on the trade. Five men and two women were in the back room cutting meat as fast as they could with power saws. Other girls were packing and putting meat in the display cases. The manager told me that this is the only way they would ever handle meat in their store. I asked him why. His answer was that packing in ice reduces shrinkage and trimming losses, and keeps a better looking product.

When I returned to California, we of the Union Ice Co. discussed this whole program and then made a proposition to the National Association of Ice Industries that if they would appropriate a certain amount of money, our company would match it and we would start a research program at the University of California to find some facts on this meat on ice proposition. They agreed and we set up the program. We obtained two mechanical display cases, one straight mechanical, another built so we could also add a bed of crushed ice.

That research has been going on now close to a year and we have a partial report on the results. It is very interesting and it shows conclusively that there is a very distinct advantage in adding ice to a mechanical case.

It is important to remember that these meat retailers buy their meat by the pound and they sell it by the pound, readily translatable into money losses.

Butcher Testifies on Value of Ice

About two months ago in company with Jim Reed of the City Ice Delivery Co. I visited Leonard's Super Market in San Francisco out beyond Golden Gate Park near the ocean. In this store is a young fellow (Grover C. Puckett) who has been in the meat business five years, who on his own decided he was going to find out what ice might do for his meat. He knew that putting dressed chickens in ice made a remarkable difference, so he ordered some crushed ice and put it in the case underneath the shelving and trays. I talked to him and a tape recording was made of our conversation.

(This recording summarized on another page told in Mr. Puckett's own words his experience with using crushed ice for fresh meats. He learned that it eliminates shrinkage and trimming, keeps the meat case odorless, keeps the meat fresher, all at an average cost for ice of about $3.00 a week; and, "They are making money by using ice.")

I make a point of how ice is being used in this market because in Syracuse they have a coil running along the back of the counter, with a bed of crushed ice like we use in produce display cases. They put a special parchment paper between the meat and the ice for steaks and roasts. Smaller cuts, chops, ground beef, etc. are put in trays, the trays resting directly on the ice.

In the San Francisco market cracked ice was put under the shelving and the recording told what it has done for him. He had to adjust his compressor because he was freezing the ice for some time when he started. Our selling job is to get ice into these meat cases where it can be seen and where it will add to the attractiveness of the meat. The ice bill is going to be within reason and any meat dealer will continue to be a customer after he has been shown.

Meat Packers Interested

While in Chicago at the National Ice Convention I took the opportunity to visit Swift & Company. C. P. Austin in the National Association of Ice Industries accompanied me and sat in on the meeting with Harry Schumacher, manager Merchandising Service, J. E. Endres and L. A. Anderson, Merchandising Service of Swift & Co. Mr. Austin had to return to the Convention so I spent the remainder of the afternoon with Messrs. Enders, Anderson and Paul Goeser, director of the research laboratory at Swift & Co. We arrived at Swift's at 1:15 in the afternoon. We finally broke up at 4:30 when the office closed for the day.

Then I called on R. C. Pollock, secretary and general manager National Livestock and Meat Board. He was interested in my story and introduced me to Max Cullen, director, Department of Meat Merchandising, National Livestock and Meat Board. This National Livestock and Meat Board does a lot of promotional and educational work. Mr. Cullen was very much interested.

I talked to Henry D. Tefft, director, Department of Packing House Practice and Research of the American Meat Institute. Mr. Tefft was very much interested.

Returning to California, I stopped off in St. Louis and spent a very interesting hour with W. B. McMillan, president of Hussman Refrigeration Ice., makers of refrigerated meat cases. Mr. McMillan is very much interested in the whole subject.

Selling Ice for Beer Cooling

RAY MULGREW

Harry F. Rathjen Co.

Oakland, Calif.

THE title of today's panel discussion "New Fields to Conquer" is very appropriate because we do have new fields to conquer in the sale of draft beer and ice refrigerated dispensing units.

As an indication, San Francisco has approximately 2,400 on-sale beer licensees and of this number about 260 are selling draft beer. In Oakland there are approximately 2,200 on-sale beer licenses and of this number about 250 are selling draft beer. So out of a total of 4,600 licensees, about 13 percent are actually engaged in the sale of draft beer.

There is a new field to conquer. Ice refrigeration can play a very important part in this field and we of the Harry F. Rathjen Company have seen first-hand the kind of equipment and service that the ice industry can offer and especially at a price that makes it possible for almost every on-sale licensee to sell draft beer.

Perhaps you have been told your ice refrigerated equipment is old-fashioned and cannot do the job, just as we have been told that draft beer is on the wane. Well, we both know that this is a fallacy.

Company Picnic Shows Keg Beer Adaptable

Last summer we sold to one of the large Bay Area industries forty kegs of beer for serving at their annual picnic. We made arrangements with the Union Ice Company for one of their ice refrigerated dispensing units and procured other equipment such as carbon dioxide gas and the ice to keep the beer cold.

The night preceding this picnic the company held a dance and between the hours of nine and twelve o'clock we sold five kegs of beer. The next day, the day of the picnic, the activities started about eleven o'clock and between that time and six o'clock that day, we sold thirty-three kegs of beer through this equipment. The beer was served at an ideal temperature and was thoroughly enjoyed by everyone and as a matter of fact, we got just as many compliments for the manner in which it poured and was served as we did for the beer itself. The only loss occurred when cups were spilled or faucets left open too long.

Incidentally, the Union Ice Company should be complimented for a good job of merchandising ice sales in conjunction with the sale of draft beer.

As we all know, one of the most important selling points of draft beer is additional profit for the seller and with our modern refrigerated equipment, we can assure the seller of draft beer the maximum profit, minimum waste, less physical effort and less cash investment. A keg of beer tapped and ready to draw represents approximately seven cases of bottle goods and to tap a keg usually requires about three minutes.

So the difference in time between putting seven cases of beer in the icebox to chill them, bringing it down to the proper serving temperature, and the time that it takes to tap a keg of beer represents money in the seller's pocket.

Advantages of Draft Beer

With the correct carbon dioxide or air pressure applied to the beer and the assurance of 'clean dispensing equipment and correct temperature, we can assure the seller of not more than one percent loss. Bottled beer on the other hand is subject to breakage and pilferage, and there are times when it becomes flat and cannot be sold and has to be replaced with fresh stock.

Draft beer is a perishable product. It presents the brewing and refrigeration industries with a few problems, but these problems cannot and do not end with the sale of our respective products. In order for us to accomplish further gains in this field, it is necessary that we acquire as much knowledge as possible about each other's products. We should know the dispensing unit and all its parts, the beer, the correct gas pressure to apply, the correct temperature for serving and the importance of clean glassware and clean dispensing equipment. If we know all of these things, the questions that arise are more easily answered. Best of all, we are better able to silence any derogatory remarks as to wrong equipment when the fault lies in other things.

Draft beer is an unpasteurized product and being under refrigeration at all times, gives the customer a glass of beer with that fresh, appetizing brewery flavor.

The sale and proper merchandising of draft beer is important to both the brewery and the ice industries. By working more closely together they each can and will do a better job of merchandising to the mutual benefit of both.

The Ice Industry

Getting Your Share of Commercial Ice Sales

WHEREVER ice dealers have done an aggressive selling job to food stores and restaurants, commercial tonnage has grown. This type of business will not walk into the ice dealer's office, for the last thing these people want to do is pay for the expense of ice. They are however very much interested in building up their produce sales; cashing in on the growing demand for ice-displayed chicken; developing a reputation for fresh fish.

To secure a volume of this business, the ice dealer should acquaint himself with the necessity for ice in the commercial establishments of his community. He should appreciate the sales appeal and profit potential which ice supplies to vegetable, chicken and fish displays. He should be in a position to point out to hotels, restaurants, soda fountains, hospitals, clubs, motels why they can give better service to their patrons at better profits through the regular use of ice.

If you are not doing a commercial ice selling job in your community, a good time to start is now! You'll be surprised what a few months application will do.—CANADIAN ICE LETTER.

Ebner Ice & Cold Storage Elects Glover President

THE Ebner Ice & Cold Storage Co., Vincennes, Ind., has elected William E. Glover of Pitsburgh as its new president to succeed the late George W. Glover. He has been associated with the Ebner Company for the last three years as vice-president and was also manager of supplies and distribution for the Republic Oil Refining Co. of Pittsburgh.

Ice delivery in Port-of-Spain, Trinidad, British West Indies. Picture taken last February by Wm. J. Williamson, Cataract Ice Co., Niagara Falls, N. Y.

Reports from Unit Ice Associations

New England Ice Association Holds Annual Meeting

THE New England Ice Association held its annual convention at the Sheraton-Biltmore Hotel in Providence, R. I., Wednesday and Thursday, April 11 and 12. The convention was opened Wednesday morning with an address of welcome by the president, Norman J. Vermette. Following the treasurer's report, President Vermette made his report in which he presented the year's activities of the association and took a look into the future.

A panel discussion was held on vending machines with the following participating: F. H. Kaup, Refrigeration Engineering Co., Montgomery, Minn.; Donald Lock, F. B. Dickinson Co., Des Moines, Iowa; A. A. Hauser, National Rejectors, Inc., New York; Wayne Cutler, Holyoke Ice Co., Holyoke, Mass.; Ralph Getchell, Jr., Getchell Bros., Bangor, Maine; Edward Kenney, Boston Ice Co, Boston, Mass.

In a talk on the National picture, Guy W. Jacobs, executive secretary of the National Association of Ice Industries sketched the work of the National Association and outlined National Ice Advertising plans for the year.

Practical talks on wage, hour and price controls were discussed by R. Flood of the Wage and Hour Division, Providence, R. I. and Albert Hoban, director of Price Stabilization Office, Providence, R. I.

Engineers Panel

An engineers' panel discussion covered operating problems. This panel was made up of Robert Ziehmn, Frick Co., Boston, Mass.; Rudy Summers, Boston Ice Co., Boston, Mass. W. G. Davis, York Corp., Boston, Mass.; A. A. Hauser, National Rejectors, Inc., New York; Austin Peck, Point Judith Ice Co., Kingstown, R. I. A question and answer period followed.

At the final session a merchandising council was held with discussions on the icing of vegetables and poultry, ice-using equipment, display rooms and advertising. Those on the icing panel were: Chas. Harris, County Agricultural Agent, Segrogansett, Mass.; A. C. Christopher, Agricultural Extension Course, University of Rhode Island; Harry Herman, Providence, R. I. Those on the equipment, display rooms and advertising panel were: Mrs. Harry Herman, I.C.E. Sales Co., Inc., Providence, R. I.; Chet Lamson, R. S. Lamson & Sons, Hudson, Mass.; Arthur Braitsch, A. Braitsch Advertising, Providence, R. I.; Peter F. Hogan, Liberty Ice Co., Springfield, Mass.

The subject of oil burners and oil was discussed by Leo Clugh, Toridheet Burner Co., Cleveland, Ohio and Fred Clark, Socony-Vacuum Oil Co., Providence, R. I.

The annual banquet was held Wednesday evening in the hotel ballroom followed by some very fine entertainment which was enjoyed by all.

Officers and Directors

Officers and directors were elected as follows:

President, Peter F. Hogan, Springfield, Mass.

Vice-presidents: Moe Widrowitz, Versailles, Conn.; Ralph Getchell, Bangor, Me.; Edward Kenney, Boston, Mass.; Richard Painchaud, Concord, N. H.; Walter B. Chaffee, East Providence, R. I.; Leon Whitman, Brattleboro, Vt.

Secretary to the Board: Bernard Hogan, Springfield, Mass.

Treasurer: Albert Westcott, Boston, Mass.

Asst. Treasurer: Oliver Hill, Natick, Mass.

Directors: George Breen, Providence, R. I.; Moe Widrowitz, Versailles, Conn.; Leon Whitman, Brattleboro, Vt.; Watson Clark, Rumford, Me.; Richard Painchaud, Concord, N. H.; Bernard Powers, Worcester, Mass.

At a meeting of the board of directors following adjournment of the final session, it was voted to continue the operation of the association on its present basis. Peter Hogan, the new president, will call a meeting of the board very shortly to outline his plans for the coming year.

While the association presented a very fine program combined with an enjoyable dinner and entertainment, it was much regretted that the attendance was not up to normal. The usual group were present, consisting largely of members of the companies who are progressing and doing a satisfactory business, but the other companies who, from year to year, fail to put in an appearance did not add to the enthusiasm of the sessions. Again this convention proved that a considerable amount of responsibility in forging ahead in the ice industry lies in the hands of top management.

Northwest Association of Ice Industries

L. F. MARSH, *Secretary*

ICE business in the Northwest is receiving the benefit of sunshine and it seems that there might be a chance to have a reasonably good year from a tonnage standpoint, although tonnage will probably be down from last year.

Profits in the ice business are difficult to estimate because of the rising expense of ice delivery and other costs. Most companies have been reluctant to raise ice prices although a few did last year. Now with prices frozen it is not possible to raise them. If the regulations are thawed and permission to increase prices enough to show a profit is granted there will be a problem of making a change in prices in the midst of the season. That is a question that will have to be met by each company, but there is no question about the ice industry feeling that it faces a difficult year.

Manpower is scarce, good men are even harder to get than in the past. Wages have gone up in many places again in 1951, and this makes added troubles to those who are faced with the responsibility of showing a profit.

Members of the Northwest Association are at present placing orders for a carload of paper bags. This makes it possible to save a very nice sum. Actually the saving made on this one order will be more than the amount of dues paid by the member in most cases.

Sized ice is holding up well in tonnage. Although a number of small ice-making machines have been installed, some new business is being developed. Most of the sized ice in the Northwest is delivered in wet strength paper bags. Some companies make cubes but most of them report that sales are small and that customers seem to prefer the beverage size crushed ice.

Mountain States Spring Conference

A SPRING conference of the Mountain States Association of Ice Industries was held at the Brown Palace Hotel, Denver, Colo., May 18 and 19. This was entirely a round-table and conference session and much valuable information was developed on merchandising and diversification, and the labor problem. Friday evening a cocktail party and banquet was held.

Canadian Association Spring Conference

INTEREST in current ice industry affairs was again demonstrated in Brantford, Canada, April 10, when seventy-one ice dealers and associate members gathered for the spring ice conference of the Canadian Association of Ice Industries.

In his opening remarks President C. W. Goodrich of Vancouver, gave a report of diminishing domestic ice markets on the U. S. West Coast, due primarily to rapidly increasing labor costs and aggravated by the increasing force of mechanical refrigerator promotions. "This should be a lesson and a challenge to all of us in Canada," he said, "to do the most efficient job in production and servicing we know how, and to be increasingly aggressive in the management of our businesses."

Two speakers on the morning program, Clarence A. Hines and Ike Greenberg reinforced the conclusions of Mr. Goodrich. The former made an illuminating presentation on "Charting Your Business by Record" and Mr. Greenberg led a discussion on "How to Use Your Supervisors." The big answer to higher costs is constant checking and cost control throughout the entire business operation, and through strict supervision of delivery service and personnel, the speakers pointed out.

Luncheon chairman was G. O. Paterson of Brantford, and this became really a gala event, featuring Southern fried—Tender-Grown chicken sponsored by Swift Canadian Co. Limited. Everyone was handed a large bib, gaily decorated, with the admonition that knives or forks were not to be used. Then arrived huge, heaping platters of fried chicken.

This is the chicken that has been advertised in full-color in the leading magazines. Mr. Noonan of Swift & Co., in his luncheon address, told how ice is an essential part of the Tender-Grown chicken merchandising program. For processing, shipping and display, ice is used in large quantities. At the present time Mr. Noonan said, Swift's two Canadian chicken plants, one at Stratford and one at Belleville, were processing 40,000 chickens per week. He told the ice dealers that Swift's cannot nearly keep up with the demand for this chicken, but the company's planned expansion in this department, will eventually cater to the entire Canadian market.

The afternoon session was under the joint chairmanship of Keith Cooper and W. W. Staples. One of the association's four new training films was shown as a starter, and then the meeting took up the form of a round table discussion on the problems of "Improving Small Plant Operations." Messrs. Lock, Fischer, Boyle and Caldwell served as the panel of experts and many situations relating to plant operation and increased production were discussed.

Plans were outlined at the conference for what will be the greatest concentration of ice advertising ever attempted by the industry. This is a triple-barrelled campaign embracing (1) national magazines, (2) metropolitan daily newspapers and (3) local advertising material.

Beginning in a list of twenty-six daily newspapers, advertisements will appear regularly, approximately once a week through May to late June. In the May issues of these major Canadian magazines, Canadian Home Journal, New Liberty and the Chatelaine, and the May 19 issue of Start Weekly, a quarter page advertisement appeared. The larger budget for 1951 provided by increased subscriptions to Canadian Ice Foundation means a 12,225,000 circulation of publications carrying Spring ice advertisements.

Regular issues of the Canadian Ice Foundation bulletin "Planned Ice Merchandising" are being mailed to subscribers to keep them informed on the progress of the campaign.

Florida Association Merchandising Forum

Speakers at Florida Forums Seated, Miss Muriel Washburn, Jacksonville; Frank Goodwin, University of Florida; E. E. Melton, president Florida Ice Association, Mulberry, Fla.; Mrs. Voy Hodge, Panama City; Standing, Frank Pisani, University of Florida; Daniel Prager, S & S Vending Company, Arlington, Va.; C. A. Kalbfleisch, Swift and Company, Nashville; and Eugene Lokey, president of Gulf Ice Association, Panama City, Fla.

ICE manufacturers from all parts of Florida gathered at the Dixie Sherman Hotel, Panama City, Thursday May 3 to discuss marketing problems which face the industry. Sponsored by the Florida Ice Manufacturers Association, a number of ice distributors from Southern Alabama also were present. Assisting in providing speakers for the program was the General Extension Division of the University of Florida.

Dr. Frank Goodwin, with the Department of Marketing, College of Business Administration, University of Florida, was one of the principal speakers. Mr. Goodwin is well known throughout Florida as an authority on merchandising and salesmanship.

Dan Prager, until recently director of the Personnel Training and Marketing Department, National Association of Ice Industries, and now Regional Manager of the S&S Vending Machine Company, spoke on "A New Era in the Ice Industry."

Produce icing, as a tonnage builder, also possibilities of sales for party and sized ice were discussed. Facts discussed in a recent house-to-house survey on what the housewife thinks of ice refrigerators and the service she gets from the ice industry revealed a great deal of interesting information.

Representatives of refrigerator manufacturers and other associate members were on hand to give those present tips on increasing sales of ice-using appliances.

Unit Ice Secretaries Hold Annual Meeting

NINETEEN members of the Unit Ice Association Secretaries' Council attended the group's annual meeting, held in Washington April 26-28 under NAII sponsorship. The secretaries met in the Mayflower Hotel.

The first session took place Thursday afternoon, following a luncheon get-together in the hotel's North Room. A luncheon guest was the Hon. Graham A. Barden, member of the U. S. House of Representatives from North Carolina.

Guy W. Jacobs, NAII executive secretary, welcomed the secretaries to Washington. His greeting was reiterated by Mount Taylor, his predecessor, who was present during the first part of the session. Miss Muriel Washburn, current president of the Council, then officially opened the business portion of the meeting.

Following the financial report by Mrs. Edna Vaughan, secretary-treasurer, a talk on "The Iceman and the National Emergency" was presented by William T. Jobe, legal counsel of the National Association. C. P. Austin, NAII director of research and engineering, next spoke on the progress of ice research and on the government equipment program, to which part of his efforts are now devoted.

New Fields

"New Fields to Conquer Via Public Relations" was discussed by Francis X. Timmons, National Association director of advertising and publicity, supplemented by a report on local publicity by John G. Pool., also of the Public Relations Department. Mr. Timmons described the activities of the Department, with special reference to advertising mats and other media that is available for local advertising.

Friday's meeting also began with a luncheon, at which the following were special guests: Harry C. Holland, Food and Restaurant Division, Office of Price Stabilization; Walter S. J. Swanson, assistant to the director, Institute of Scrap Iron and Steel; and Glenn E. Jackson, executive director, Orthopedic Appliance & Limb Manufacturers Association.

An open forum took up the major share of the second session, touching on these subjects: personnel training, opportunities in display icing of produce, poultry and meat, new projects in Hydro-Cooling and field icing, methods of combatting on-premises ice-making machines, merchandising of ice-using appliances, use of vending machines, and association management.

Saturday the entire group attended the one-day convention of the American Trade Association Executives, also held at the Mayflower. Addresses by officials of the Office of Price Stabilization and the National Production Authority were heard during the morning. Gen. Wm. H. Harrison, former administrator of the Defense Production Authority, spoke to the convention at lunch. In the afternoon a panel discussion conducted by various officials of the defense agencies was featured.

Northwest Association One Day Conference

L. F. MARSH, *Secretary*

EVERY ice man in the Northwest, whether or not a member of the association, should plan on attending the next conference of the Northwest Association of Ice Industries. A one-day meeting will be held at Aberdeen, Wash., probably July 13.

There is another of the Northwest conference meetings that have been held regularly in early summer and late fall. They have proved of so much value to those who attend that there is no question at all about their being continued. A good attendance is expected.

These conferences provide a valuable opportunity for all ice men to talk over problems with others in the ice business. When a question is asked about how something is done, there are always several who will tell just how they do it. The one who asks the question is given the combined knowledge of those assembled. Often something is brought out in the answers that offer ideas that are worth money to many listeners even though they may have thought they had the answers. Entertainment will be provided also.

Faulty Gas Appliances In New York City

DEFECTIVE gas flame appliances totaling 1,066 have been found by inspectors checking 2,110 apartments in New York City, particularly in Manhattan, in the Health Department drive to locate such equipment in an effort to curb carbon monoxide poisoning from faulty appliances. The defective equipment located thus far included ninety-one refrigerators.

Canadian National Ice Advertising

THE Canadian National Ice Advertising program marched into the month of May with the greatest frequency of insertions, the greatest overall coverage, and the greatest readership of all time! Never before in the history of the Canadian ice industry has so much publicity been given to ice in any one month, according to a bulletin of the Canadian Association of Ice Industries.

Reprints of both the magazine and newspaper advertisements are available at cost of printing. It is suggested that ice dealers take one of the newspaper advertisements and fold it in the center horizontally, making a folder, then on the front put a catchy heading or illustration and space for addressing and on the back place a message about service and products available.

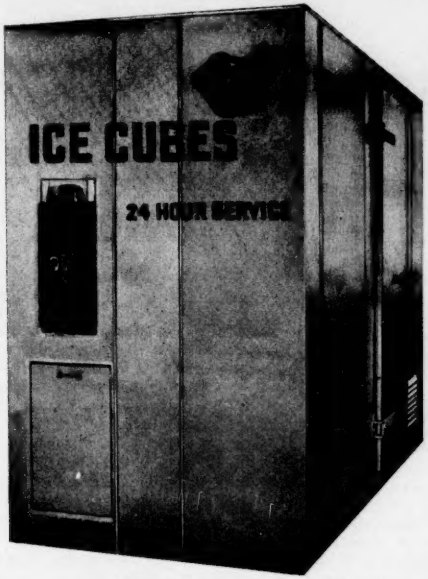
Now is the time, the bulletin says, to get out and make personal calls on furniture stores and other ice refrigerator outlets in the community, and offer cooperation. Ice refrigerators should be on display in all retail stores now. Many ice dealers have arrangements with local ice refrigerator outlets whereby they pass along leads of prospects, give the first icing free of charge or special drain installation offer. The ice dealer of course gets the continuing ice business. Working with these retail stores can develop many sales that might have gone to mechanical, and cooperation from the ice man will put these stores in a better frame of mind toward ice refrigerators.

The advertising committee is at the service of the members. If they need suggestions or advice on certain of their merchandising or advertising activities, this committee may be able to provide valuable aid. This also works in reverse for members may have devices, special selling schemes and advertising ideas that will be of interest to their fellow Canadian Ice Foundation subscribers.

Florida Ice Dealers Oppose Chain Store License Tax

ICE plants and dealers would be exempt from the chain store license tax under the provisions of a bill introduced in the Florida legislature. Those who are specially affected by the bill say the present law discriminates against ice plants and dealers engaged principally in the sale of ice but who desire to sell a few side products. The chain store license tax now is $400 a year.

The NEW POLAR
CUBED and CRUSHED
ICE VENDING STATION



Patented—Design Patent Applied For

Belt Capacity— 50 ten-pound bags
Storage for 200 ten-pound bags
PRICE-LESS THAN $1500.00

POLAR PRODUCTS ARE BUILT OF THE FINEST MATERIALS BOTH *EXTERNALLY* AND *INTERNALLY*.

Check these POLAR features:

1. Completely covered with embossed aluminum.
2. Armstrong fibreglas insulation.
3. Aluminum foil vapor seal paper.
4. Automatic electric defrost.

ALL of these special POLAR features are included in the new Premium ice vending units.

1. Gives maximum utilization of refrigerated space. Ice can be bagged in station.
2. Fits in a small space, easily placed. Cabinet is 8'-10" long, 6'-6" high, 46" wide. Specially suited for heavily populated downtown locations.
3. Shipped ready to operate—just plug in. Equipped with front light and time clock.
4. Beautiful in appearance. Identical material as used in regular POLAR line.
5. One piece aluminum weatherproof roof.

For further information and descriptive literature-- write

REFRIGERATION ENGINEERING COMPANY
Montgomery, Minnesota

WITH

ALUMISEAL

U. S. Pat. App. For — Reg. U. S. Trade Mark

INSULATION

Vapor-Proof Lead-Faced Tape at Joints
Positively Seals Out Moisture!

Alumiseal is unique *double duty* insulation. A combination of solid aluminum alloy sheets that reflect and defy heat with joints sealed tight as a drum by *lead-faced vapor-proof tape* that defies moisture. Nothing else equals Alumiseal. Its *clean, sanitary finish* is rust proof, rot proof, vermin proof, fire safe. No deterioration, no costly replacement, no maintenance, no painting.

Alumiseal is ideal for freezers, coolers, bakery proof rooms, fermentation rooms, hardening rooms, banana ripening rooms, bulk storages—used extensively in all-weather test rooms and altitude chambers where temperatures range from minus 100°F. to plus 200°F. —any refrigerated or controlled humidity structures.

TYPICAL ORGANIZATIONS USING ALUMISEAL

A & P Bakery Division
Bakeries, Inc. (Sub. of Stop & Shop)
Best Foods, Inc.
Bickford's, Inc.
Breakstone Bros., Inc.
Brockton Coop. Egg Auction Assn., Inc.
Cushman's Sons, Inc.
Detroit Creamery Company
First National Stores
Food Fair Stores, Inc.
General Electric Company
General Foods Corporation
Chas. D. Glennie, Inc.
General Motors Research Lab.
Hathaway Bakeries
Hot Shoppes, Inc.
Kraft Foods Company
Kroger Company
Land O'Lakes Creameries, Inc.
Muller Dairies, Inc.
National Biscuit Company
National Dairy Products Corp.
National Tea Company
Reick-McJunkin Dairy Company
Sheffield Farms Company, Inc.
Southern Dairies, Inc.
Standard Brands, Inc.
Tom Boy Stores, Inc.
University of Vermont Dairy Bldg.
Ward Baking Company

Write us today for information on how ALUMISEAL can solve your insulating problem.

C. T. HOGAN & CO., INC.

383 MADISON AVE., NEW YORK 17, N. Y.

Over a Decade of Experience in Reflective Insulation

FrozenFoods
*Reg. U. S. Pat. Off.
PREPARATION PACKAGING FREEZING STORAGE DISTRIBUTION DESIGN CONSTRUCTION EQUIPMENT

Frozen Food Requirements for 1951

COL. C. F. KEARNEY
Commanding Officer
Quartermaster Market
Center System

I CONSIDER it a most appropriate time and am grateful for the opportunity of appearing before the members of the National Association of Frozen Food Packers. The time is appropriate because this gathering has been scheduled on the heels of a declaration of National Emergency, the implications of which in the way of sacrifices, expenses and hardships, cannot at this time be seen.

A question very frequently asked me is, "What are the plans of the market center system during the ensuing year?" The question uppermost in your mind is probably how will my business and my industry be affected, what should I or can I do to prepare for the future? The answers to these questions are very involved and contingent upon many unforeseen factors, and I can assure you that it would be difficult to answer you in detail. However, I will endeavor to present a picture of our future plans.

Our procurement pace has accelerated tremendously and will continue to grow. The present target of 3½ million men under arms by July 1951 means more equipment for the troops, more bodies to be clothed, and more mouths to be fed. It is easy to see that our requirements are definitely on the upswing.

Needless to say, as this program intensifies, our problems naturally multiply. We find ourselves confronted with price control, shortages of packing material, personnel problems and many other equally serious issues. None of these new or complex difficulties are insurmountable. With the help of your industry and you as individuals, we can defeat any contingency which may arise. During the past, your splendid support and fine cooperation have been fully appreciated and will, in the future be needed more and appreciated even more.

Summary of address at annual convention National Association Frozen Food Packers, San Francisco, Calif., February 28, 1951.

Issue and Resale Items

This would probably be a good time to clarify the distinction between procurement of issue items and resale items. Issue items are procured on the open market according to specifications, brand names not being a consideration. Consideration is given primarily to cost and ability to produce. Resale items which are to be sold in the commissaries are purchased according to the brand name desired by the sales officer or installation. The brand name desired by the installation is determined by the wives and families of soldiers at the installation. A comparable or parallel situation would be your wife going to the grocery store and ordering her favorite frozen item by brand name. Since your wife is paying her money for an item, she has every right to demand the brand name she desires, and in the case of the soldiers' wives, since she is paying her money for an item, it is only fair that she be given the opportunity to buy the brand which she desires.

Frozen Fruit and Vegetable Program Expands

As I survey the picture for frozen fruits and vegetables I see a program which has expanded considerably.

Prior to March 1950 only three frozen vegetables appeared on the master menu and these were listed on a substitution basis only—the cost of frozen products and availability of fresh vegetables were the factors considered. From March 1950 until January 1951, spinach, broccoli, and cauliflower have appeared on the master menu as regular issue items. Since the first of the year three more items were added, namely, asparagus spears, peas and brussels sprouts, making a total of six frozen vegetable issue items. The frequency of issue has increased from one to four times a month in 1950 to an average of six times monthly for the first half of 1951, as anticipated in the master menus.

To sum it up, there are twice as many different frozen vegetables appearing twice as often on the 1951 master menu as compared to the 1950 menu. With the increase of military personnel, which I mentioned earlier, a considerable increase of frozen fruits and vegetables will be utilized by the Armed Forces.

For your information, the issue factor for frozen vegetables is ten pounds per hundred men for one meal. The issue factor for frozen concentrated orange juice is four quarts per hundred men.

The frequency at which frozen concentrated orange juice is issued will vary from six to eight times monthly during the winter season and from ten to twelve times during the summer months. There has been a recent change in specifications whereby sweetened concentrated orange juice is established as an alternate for the natural. Specifications on other frozen fruits and vegetables remained unchanged and include that only current season pack may be supplied from those processors who are able to furnish continuous Department of Agriculture inspection.

Issue requirements to our overseas commands have increased proportionately. The fact that industry has improved and enlarged their facilities for handling, shipping and storing of frozen items, has given much impetus to this accelerated program.

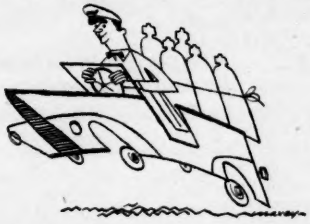
U. S. Standards

The U. S. Standards published by the Department of Agriculture Production and Marketing Administration are applicable to all Government purchases. The grade requirements for troop issue are "B or Bet-

Empty cylinders can't help you . . .

but they can help us . . .

give you faster Ammonia service



So look around your plant and make sure that every empty ammonia cylinder has been returned.

Armour's Anhydrous Ammonia is pure and dry, free of moisture and non-condensable gases and, to insure trouble-free operations, every cylinder is always tested and checked before shipping to give positive assurance of fine quality.

Armour's 65 conveniently located stock points assure you prompt delivery of anhydrous ammonia where you want it—when you want it—and fast. Help us continue this good service by returning your empty ammonia cylinders *now*.

Available in 50, 100 or 150 pound cylinders.

You can depend on Armour's Ammonia and Service

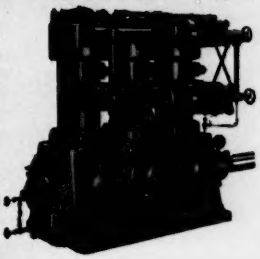
ARMOUR *Ammonia Division*

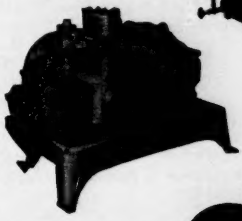
Armour and Company, 1355 W. 31st. St., Chicago 9, Ill.

IN REFRIGERATION *it's All in knowing* HOWE

STANDARD AMMONIA COMPRESSORS in sizes to 150 ton. For that difficult two temperature job, use Howe Multiple Effect type compressor and save in first cost, power cost, installation and maintenance.

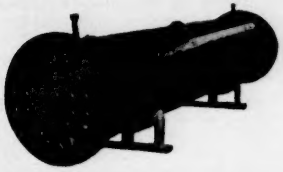
A size and type for every job!

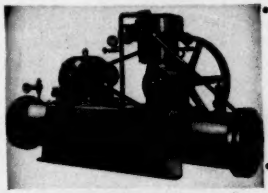




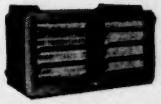
FREON-MYTHYL CONDENSING UNITS

SHELL AND TUBE CONDENSERS AND EVAPORATIVE CONDENSERS





FULL AUTOMATIC AMMONIA COMPACT UNITS



DOUBLE FAN UNIT COOLER

POLAR CIRCLE COILS

Write for illustrated catalog.

HOWE ICE MACHINE CO.

2829 Montrose Ave., Chgo 18 Cable: HIMCO, Chicago

ter" for frozen vegetables and "Dessert" pack of frozen fruits. Fruits are packed in five to thirty-pound containers and vegetables in two to five-pound institutional size packages. Hospital and resale needs may be supplied with Grade A when available. Resale items are packed in ten to sixteen oz. family size packages.

Brand name items may be bought for resale in which case no notice of intent will be issued. The parent processor or branch office is contacted and negotiations are concluded. There are no grade requirements on brand name purchases, it being felt that the reputation of the processors is the assurance of quality. Destination inspection in these cases is for count and condition only.

Inspection requirements for frozen fruits and vegetables vary. In quantities over 1000 pounds it is required that a new Department of Agriculture inspection certificate be issued. Procurement is accomplished far enough in advance to allow for new inspections. Quantities under 1000 pounds may be shipped providing an inspection certificate had been issued within ninety days; in which case the vendor must furnish at the time of award the inspection certificate number, lot number, place and date of inspection.

Regarding our requirements for current inspection when the quantities are 1000 pounds or more, products of this quantity may be shipped, stored, and rehandled several times before being consumed. Therefore, it was decided that new certificates must be issued. The lesser quantities are subject to quicker consumption and will be accepted based upon a certificate not older than ninety days. All products, however, must have certificates.

Market center procurement for 1950 can be broken down as follows: 29½ million pounds of frozen vegetables, 8½ million of frozen fruits and 5½ million of frozen concentrated orange juice. The projected procurement for 1951 is estimated at 56 million frozen vegetables, 10½ million frozen fruits for a total of 66½ million as compared with the 1950 total of 38 million, total frozen concentrated orange juice for 1951 is anticipated at 11,000,000 pounds.

With the continued cooperation of the frozen foods industry, and particularly of your members operating in this area, our efforts will be successful in providing the men and women in the armed forces with the food they so rightfully deserve.

1950 Frozen Pack Reaches Record High

MORE frozen fruits, berries, and vegetables were packed in 1950 than in any preceding year. The 1950 pack statistics bulletins of the National Association of Frozen Food Packers, released May 15, indicate an over-all pack of 1059 million pounds of frozen fruits, berries and vegetables, and more than 28 million gallons of frozen concentrated citrus juices. The citrus concentrate total was about 2 1/3 times as great as the preceding year, while the fruit and vegetable pack was up 15 percent. Prior to 1950, the largest fruit and vegetable pack was in 1946, when the total was 969 million pounds. Production in 1950 was 9 percent above that level.

Vegetable Pack

The 1950 frozen vegetable pack of 587 million pounds established a new record high. While this total was only 4 percent above 1949 production, 1950 was the third consecutive year that frozen vegetable production showed an increase above the preceding year. The increase in pack in 1950 resulted from substantial increases in the packs of a few items such as green peas and snap beans which more than offset moderate reductions in the packs of several other products.

Container-size usage in packing frozen vegetables in 1950 conformed closely to the 1949 pattern: About 66 percent of the total was in retail sizes, 20 percent in small institutional sizes (over 1 through 10 pounds) and 14 percent in sizes of more than 10 pounds.

Regional production of frozen vegetables showed some changes in 1950. The packs in both the West and especially in the Midwest represented smaller percentages of the total pack than in 1949. Production in the East and South accounted for a larger percentage of the total U. S. pack.

Fruits and Berries

The 1950 frozen fruit and berry pack, amounting to 472 million pounds, was one-third greater than the 1949 total, and was the second largest pack on record. It was exceeded only by the 1946 pack, when the total was 519 million pounds. The big gain in volume in 1950 is attributable primarily to great increases in the packs of frozen strawberries, frozen R. S. P. cherries, and grapes and pulp. Most other packs were smaller than or about equal to 1949 totals.

Container sizes used for frozen fruits and berries were not much different in 1950 than in the preceding year. Retail sizes again accounted for some 20 percent of the total, and sizes ranging from 2½ through 10 pounds still represented only about 2 percent of the total pack. Among the large institutional and industrial sizes, the use of the 30 pound size increased, while the barrel pack represented a significantly smaller percentage of the total than in prior years.

Regional Increases

All regions participated in the increased pack of frozen fruits in 1950. Some regions, however, gained relative to others. The pack in the Northeast represented a slightly greater percentage of the total than in 1949. In both the South and the Midwest, the percentage of the total was much greater than last year, while the proportion of the pack produced in the West declined. Production in the West, however, continued to represent a far greater percentage of the total pack than any other single region.

New Storage Warehouse for Frozen Foods

THE Patterson Cold Storage deep freeze warehouse at 2481 Dennis Street, Jacksonville, Fla. is being more than doubled in size by construction of a new wing containing 30,000 square feet of storage space, it was announced recently. James W. Patterson, president of Florida Ice and Machine Corporation which owns the plant, said the construction by E. C. Kenyon, general contractor, will be completed about May 1.

The first unit of the cold storage warehouse was opened February 7, 1950, as a transit storage point for frozen foods and citrus products awaiting shipment to northern and Midwestern markets. The first wing contained 24,000 square feet of storage space, giving a capacity of about 10,000,000 pounds of frozen foods.

Temperatures in the warehouse will be maintained at approximately zero Fahrenheit. The concrete block building will be insulated with seven-inch cork board insulation below the floors and 12-inch Fibreglas insulation on the roof. Ammonia compressor pumps will supply the freezing units. The enlarged warehouse will have a rail siding accommodating approximately six cars and truck loading platforms for about 15 trucks.

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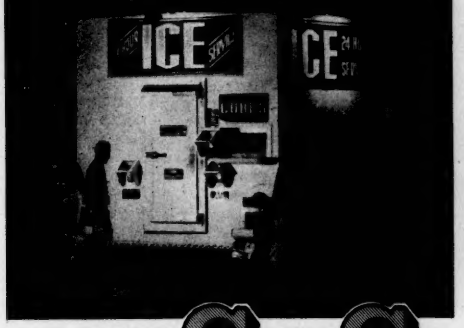

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NEW FROZEN FOOD TECHNOLOGY

Technological developments stemming from research in frozen foods have produced new products, new processes, new equipment and new technique, all within the last forty years

E. H. WIEGAND
Food Technology Dept.
Oregon State College

FORTY years ago the frozen food industry was still a dream in the minds of the pioneer experimental workers. Could they have had the vision to see an industry with an estimated value of 700 million dollars in the year 1950? Would they have predicted an industry with 1,043 active frozen food packers, 1,200 different brands and 200 varieties of frozen foods? Perhaps even their wildest dreams might not have pictured the frozen food industry as it stands today—important to the growers, to the processors, to the distributors, and to the consumers. The status of the industry in 1951 is one of which we can be proud as it represents the efforts of every branch of the industry.

The recent technological developments have stemmed from research in industrial laboratories, in federal laboratories and in university laboratories. Agricultural experiment stations throughout the country have added the results of their research on frozen food problems to help the industry in its movement forward. Research, basic to the progress of any industry, has done much to shape the course of the frozen food industry.

The recent developments are evident in three areas—new products, new processes, and new equipment. Nothing in 1950, however, has had such an effect on the whole industry as the high vacuum, low temperature evaporator had in the 1948-49 period. Nonetheless, one cannot look through a list of new frozen products without giving thought to the continued application of this process to new frozen concentrate products. The boom in the citrus industry can well be attributed to the expansion of the market for concentrated frozen orange and lemon juices. This connotes consumer acceptability of these new products, and predicts good things for other frozen concentrates of good quality.

New Products

A few words about new products. It is significant that one-third of all research time is spent on the development of new products for the food industry. An estimated 40 million dollars is spent on improving products and developing new products. These facts speak well for the food industry—a real effort to give the consumer better food products at a lower price which is the goal of all research, in the final analysis.

The frozen food industry has moved along with the rest of the food industry in contributing new products to the markets. One of the most recent frozen concentrate products is milk, still in experimental stages of development. But according to the USDA Bureau of Dairy Industry, frozen concentrated milk that will remain acceptable after storage is very possible. . . and much research is being done to solve the technical problems of production and distribution upon which success hinges. Protein separation or curdling is a big problem.

Frozen coffee concentrate, now on the market, holds great promise for the industry. As a nation of coffee drinkers, the market potential is significant. One company is already marketing a 5½ ounce jar of pure coffee concentrate, tapping a market of over a billion dollars in consumer coffee purchases.

Fresh frozen apple concentrate has been studied both on the East and West coast by regional research laboratories. The Western Regional Research Laboratory, working with Washington apple growers, has developed a juice with the same flavor as high quality freshly pressed juice. Using Grade C fruit which sells for $8 a ton, a market for this lower quality tree fruit has been developed.

The first plant to be designed specifically for frozen juice concentrates—the Golden Citrus Juices plant in Anaheim, California—spotlights the importance of the juice concentrate industry today. This plant handles frozen orange, lemon, grapefruit, orange and grapefruit blend as well as orangeade and lemonade bases.

Today's markets of frozen foods show frozen cranberry juice, Concord grape juice, lemonade, prune juice, tomato juice, and a chocolate milk drink—all new products to the growing industry. Some of these products are in the "test market" stage, on their way to win consumer acceptance. Certainly they are spreading the scope of the industry into fields that the early pioneers could never have imagined.

The Colorado Agricultural Experiment station has introduced frozen fruit pie mixes which have superior color, flavor, and texture. This new uncooked frozen fruit pie mix will be an additional outlet for frozen fruit, and will provide consumers with a product containing full fruit flavor.

Frozen salmon cutlets in tin cans have been added to the market by the Pacific American Fisheries in Bellingham. Two skinless, boneless cutlets, separated by a waxed cardboard disk are placed in a one pound salmon flat, then frozen. Certainly this is something new in the frozen food industry.

Experimental work by the Fish and Wildlife laboratory in Ketchican, Alaska, shows that quick freezing and low temperatures produce the best frozen pink salmon fillets. These fillets were treated with an ascorbic acid dip, wrapped in moisture proof paper (plastic film) before freezing. The best preserved samples were kept at -20 F.

Frozen Specialties

Frozen food cabinets today have a wide variety of unique frozen specialties—smoked chicken frankfurters, smoked chicken burgers, three frozen spreads, cheese tortoni, potato puffs, pecan muffins, French pastry, Scotch scones, stuffed lobsters, breaded fantail shrimp—not to mention pan-fried, ready-to-eat frozen chicken. Consumer acceptance of these products will determine to what extent they are produced, and to their effect on the total frozen food picture.

Still on an experimental basis but becoming closer to the day of commercial application is electronic heating of foods. Blanching of fruits and vegetables to inactivate enzymes and the rapid thawing of frozen foods by dielectric heating will result in higher quality packs.

Address at annual convention National Association Frozen Food Packers, San Francisco, Calif., February 27, 1951.

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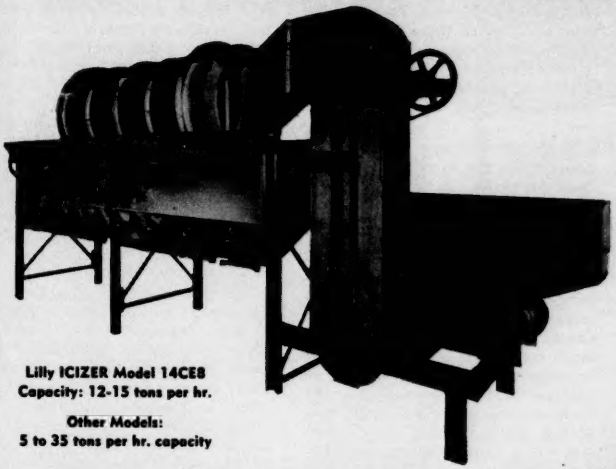

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A pilot plant continuous dielectric vegetable blancher was designed in the Food Technology department at Oregon State college last year for work in experimental blanching studies. Comparison of commercial steam blanching of vegetables for freezing as to quality and cost will be made with the new blancher.

Dehydrofreezing

Dehydrofreezing is a process which shows promise. By combining dehydration and freezing, the desired loss of weight and the retention of fresh quality are gained. Experiments on peas show that dessication could be carried on to the extent of about 50 percent reduction in weight without significant changes in organoleptic quality. A panel of 150 tasters could not distinguish between conventionally frozen peas and dehydrofrozen peas in an experimental test. Dehydrofrozen apples were judged superior to the conventionally frozen product, with much better flavor when cooked in pies. Encouraging results with peas, apples, carrots, potatoes, apricots, cherries and boysenberries may be pointing the way to commercial application of this method.

Experiments with immersion freezing have been done in federal laboratories, with results showing the freezing rates to be several times as fast as those obtained in the conventional air blast or package freezing systems. It is appreciably faster than plate freezing methods, according to their results.

New Equipment

New equipment has a place in the technological development of the frozen food industry. The change from batch to continuous flow of materials through a plant has stepped up production to figures which the early pioneers might question.

The recent introduction of the New Marathon corporation "Marapak unit" has speeded up the packaging of frozen foods 100 percent. The average of 115 packages per minute has been stepped up to 200 to 225 packages per minute, for free flow items by this new high speed automatic packaging machines. End fill packages are used.

Good news on the frozen food distribution front is the mechanically refrigerated railway car to transport frozen foods. The Thermo King unit provides uniform controlled temperatures which can be adjusted in a range of minus 10 to plus 50F. Tests thus far have proven practical and the Fruit Growers Express have added a fleet of these new cars to its line. The Diesel electric units manufactured by Frigidaire also provide zero temperatures for some of these new Fruit Growers Express cars.

A simple indicator to spot any temperature rise in frozen foods has been developed at Cornell University in cooperation with the Office of Naval Research. This indicator combines oxidizing enzymes and ascorbic acid, giving warning to any possible damage to frozen foods. It consists of a gelatin gel enclosed in an oxygen permeable envelope. An oxidizing enzyme—a colorless phenolic compound—is present in the gel with a suitable concentration of ascorbic acid which regulates the color development. The possibilities of this indicator might well stimulate better storage temperatures for frozen foods.

These are only a few of the developments in the frozen food industry—as the low temperature, high vacuum evaporator took 20 years of research to develop to a commercially feasible position, so other research projects are developing new processes, new products, and new equipment.

The horizon is unlimited. Someday we will be considered pioneers, having completed a mere 40 years in the frozen food industry. What we have done thus far in the industry may be considered "elementary" beside the developments which are yet to come. Our vision will need to grow as the industry adopts the results of research to increase its scope of activities.

United States Standards for Frozen Blueberries

THE second issue of the United States Standards for Grades of Frozen Blueberries has been issued by the United States Department of Agriculture after careful consideration of all data and views submitted by individual members of the industry, trade associations, and from other sources. These standards are designed to serve as an aid in packing and as a convenient basis for sale in wholesale transactions and as a basis for determining loan values. They will also serve as a basis for the inspection of this commodity by the Federal inspection service, which service is available for inspection of other processed products as well.

Canada Locker Plants Build Demand for Frozen Foods

QUICK frozen foods which have become popular in eastern central Canada, are meeting an increased demand in Manitoba, although distance from locker plants is a handicap in rural sections, and there are other criticisms which must be met if the industry is to expand in any great degree. Increased use of home freezers would help it along, the trade says. A. L. Shewfelt, of the Morden Experimental Station, said expansion depended on improved distributing facilities, maintenance of top quality food, and to some extent on reasonably high living standards.

Inferior wrapping material and containers were reducing the quality of some frozen products, Shewfelt said. This applied particularly to meats. Another problem was the distance some patrons of the locker plants in Manitoba must travel for their produce, he said. He added that the use of home freezers for storage purposes would widen public acceptance of quick-frozen-foods and should be encouraged.

Most of the frozen food business in the province was being done by the 100 locker plants established over the past 10 years, he said. Storage space is rented and approximately 6,000,000 pounds of food are handled annually. He described a typical plant as having between 200 and 1,200 lockers, a chill room, processing room, and sometimes a retail section. He said high standards were maintained by enforcing strict regulations in such matters as construction, lighting location, water supply and sanitation. Government institutions already are making wide use of frozen foods are making wide use of frozen foods, he said.

An important development in the industry had been the manufacture in Manitoba of pre-cooked meals which were now being carried by planes throughout Canada and other countries, Shewfelt said.

Booklet on Food Freezing Issued by United Nations

A REPORT of the food freezing and refrigeration meeting held in Copenhagen, Denmark in 1948 has been issued by the Food and Agricultural Organization of the United Nations and edited by Donald K. Tressler. A news release on this booklet was published in the September, 1950 issue of ICE AND REFRIGERATION. Copies may be procured from International Documents Service, Columbia University Press, 2690 Broadway, New York.

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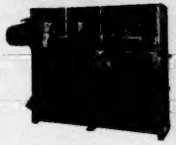

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More Large Loss Fires

LARGE-loss fires ($250,000 or more damage) increased 12 percent in 1950 over the previous year in the United States and Canada and caused 26 percent more damage, the National Fire Protection Association, non-profit fire control group reports. The findings of the NFPA have been compiled in a 64-page illustrated booklet, "Large Loss Fires of 1950 and Their Lessons" which is available from the NFPA, 60 Batterymarch Street, Boston, Mass., for one dollar a copy.

As the table below indicates there was a sharp increase in the number of large loss fires in manufacturing plants in 1950 and a substantial decrease in the number of fires in warehouses.

NUMBER OF FIRES BY YEARS BY PRINCIPAL OCCUPANCY BREAKDOWN

	1950	'49	'48	'47	'46
Manufacturing	83	67	92	64	58
Transportation	31	23	20	22	20
Mercantile	29	26	36	26	24
Storage	23	43	52	45	44
Habitational	11	11	9	6	11
Miscellaneous	66	48	59	39	30
Totals	243	218	268	202	187

As in previous years over 60 percent of all fires occurred during hours of darkness. Half of the large fires occurring in manufacturing plants originated during operating periods when detection was presumably prompt. This fact indicates that any investment made for prompt extinguishment, such as automatic protection and organization of employees into effective fire brigades, is amply justified.

More than one-third of the fires occurred in towns having less than 5,000 population or in locations outside city limits in contrast with the less than 20 percent that occurred in cities of over 100,000 population where high property values are concentrated. The comparatively weak fire protection service noted in many small communities explains in part the disproportionately large number of fires in the small towns according to the NFPA.

As in 1949 two-thirds of these serious fires were first reported by telephone. Fifteen percent were transmitted via street box.

While 61 percent of the fires started from unknown causes 68 percent of the fires of known cause could have been prevented if the hazard responsible for the fire had been properly safeguarded.

Geographically these large-loss structural fires occurred in 40 of the 48 states Hawaii and Alaska and in six Canadian provinces. The largest number occurred in California which suffered 19 of these "biggest of the year" fires.

Inhibitor Reduces Corrosion In Refrigerator Cars

THE paring of half a million dollars from the annual cost of refrigerator car maintenance has been estimated by Canadian National Railways on the results of recent experiments made in the company's research laboratory at Montreal. These experiments were aimed at reducing the corrosion to the cars caused by the action of salt brine and water.

S. W. Fairweather, vice-president, research and development, said that a new type corrosion inhibitor has been developed and proved on the "test tube" level and is now being tried with three refrigerator cars to prove its efficiency under operating conditions. Laboratory tests showed it to be from 78 to 95 per cent effective, depending on the brine concentration.

The inhibitor is composed of sodium hexametaphosphate and powdered calcium chloride and is placed in the car bunkers, in proportion to the amounts of ice and brine used. As it is only partially expended in the refrigeration process the surplus inhibitor will tend to reduce corrosion of track and bridge structures by brine and water drip.

Shoudy Executive Manager Cooling Tower Institute

AS A FURTHER step in their water conservation program, Raymond C. Kelly, president of the Cooling Tower Institute, announces the appointment, as executive manager, of W. A. Shoudy, consulting engineer of New York City.

In making this announcement, Mr. Kelly said: "We feel that both the Institute and the public are particularly fortunate in securing the full time services of Mr. Shoudy because of his extensive experience and wide acquaintanceship in the engineering world. He combines the experience of teacher, investigator, designer, constructor and operator about equally divided between public utilities and industrial plants."

A graduate of Stevens Institute of Technology, he served for eight years on that faculty and twelve years later began fourteen years service as associate professor of Mechanical Engineering at Columbia University. During the interim he served as engineer of tests with the Brooklyn Edison Company, assistant mechanical engineer with the J. G. White Engineering Corp., power engineer for the American Sugar Refining Co., superintendent of steam stations of the Adirondack Power and Light Corp. and began an extensive consulting practice while at Columbia which he has continued. His clients have included both the U. S. Army and Navy Departments and some of the country's largest industrial organizations. His activities have taken him over the greater part of this country, eastern Canada and China.

Mr. Shoudy is a fellow and past vice-president of the American Society of Mechanical Engineers and he has served as chairman of both publications and the professional divisions standing committees and has been a member of the finance and library committees and many others. He has contributed a number of papers to that society and the technical press.

1951 Edition ASHVE Guide

THE American Society of Heating and Ventilating Engineers has announced the publication of the 1951 edition of the Heating, Ventilating and Air Conditioning Guide. Completely revised and with several special features incorporated, the new edition is the largest ever issued. It contains 1048 pages of technical text grouped in 50 chapters under the following headings: fundamentals, human reaction, heating and cooling loads, combustion and consumption of fuels, systems and equipment, special systems, instruments and codes.

Symbols for use on drawing of heating, cooling and air conditioning system plans have been brought into conformity with the symbols recently adopted by the American Standards Association. The reference list of codes and standards has been enlarged to include 133 codes and standards of interest to the heating, ventilating and air conditioning engineer. The latest editions of the codes are indicated and the names and addresses of organizations which can supply the various standards are given.

Direct supervision and resposibility for the preparation of the new edition which is now being distributed to ASHVE members, was in the hands of the Guide Committee composed of: Chairman, A. B. Algren; D. B. Anderson; Nathaniel Glickman; P. B. Gordon; E. F. Hyde; B. H. Jennings; H. R. Limbacher; W. E. Long; P. J. Marschall; ex-officio, Cyril Tasker, director of ASHVE Research Laboratory, and C. H. Flink, ASHVE technical secretary.

The Guide is priced at $7.50 and is shipped postpaid. It may be ordered from the society, at 51 Madison Avenue, New York, 10, N. Y., or through Nickerson & Collins Co.

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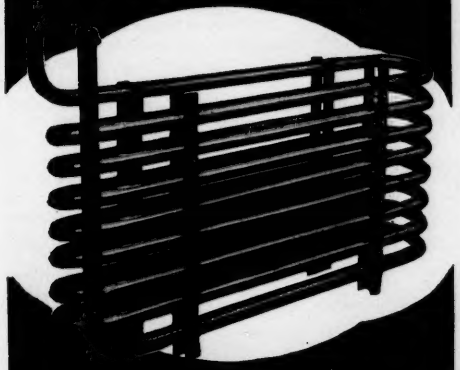

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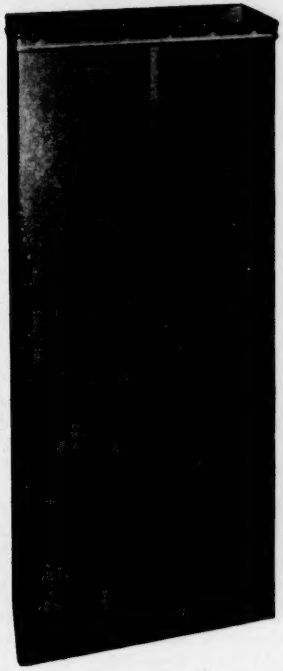

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Chicago Section, A.S.R.E.

AT THE regular monthly meeting of the Chicago chapter, American Society of Refrigerating Engineers held Thursday evening, April 12, O. E. Gammill, Jr., product manager, heavy machinery, Carrier Corp., explained the application and use of the Carrier absorption machine for heavy duty air conditioning and all other applications requiring water chilling.

One of its principle uses will be in the summer cooling of large buildings where the winter heating boiler can be put to use to supply low temperature steam (12 lbs per sq in. or less) for summer cooling. This machine is made for capacities of 115, 150, 200, 270 and 350 tons. Chilling is accomplished by flash evaporation of spray water to approximately 46 F. under vacuum. The chilled water is then used for chilling the building air.

Several advantages have been pointed out. For example, the Lithium Bromide and its aqueous solution as handled in the machine is non-flammable, non-explosive, and physiologically harmless. The machine can be operated anywhere between 10 and 100 percent of its rated capacity. The power requirement is directly proportional to its load since the heat to be removed is a function of the latent heat to be removed from spray water. There is no vibration since there are no moving parts and the entire unit can be placed on the roof, and there is a saving in excavation and foundation cost. In addition, valuable basement space can be made available for other uses.

There are other places where these machines may be used industrially at very low operating cost such as wherever low pressure steam is available, Mr. Gammill said. Also, other sources of heat may be used such as the exhaust from diesel or gas engines.

Buffalo Section A.S.R.E. Elects Officers

CARL R. FAGERSTROM, chief draftsman of the Niagara Blower Company has been elected chairman of the Buffalo Section of the American Society of Refrigerating Engineers. Other officers are: First vice chairman, Robert J. Hess; second vice chairman, Bliss K. Wolcott; secretary, Ralph W. Talley, and treasurer, Reuben E. Ott. Harold W. Whiting was elected a director. The officers were installed at a joint meeting of the Buffalo and Toronto sections in Toronto May 11.

Sales and Reorganizations

Phoenix, Ariz.—The Crystal Ice and Cold Storage Company has purchased for $80,000 the plant and property of Arizona Frozen Foods Corp. at 2100 Christy Road.

Punt Arenas, Costa Rica—The Pacific Refrigeration Company of Oakland, Calif. has purchased the large refrigerating plant operated by the Van Camp Sea Food Company here. The plant will be operated as a public utility under a new concession granted by the Costa Rican government, but will continue to receive fish from Van Camp craft in Central American waters. Van Camp authorities said the sale was a result of the company's new policy of confining its operations to the continental United States.

Evansville, Ind.—Ice Service Inc., has purchased the ice interests of Service Ice Co. and Tucker & Sons. The two newly purchased plants will no longer sell ice. The purchasing company will serve their customers.

Shelbyville, Ind.—The Daniel DePrez Manufacturing Co. here has been purchased by a new corporation headed by Leland Lusk. The new corporation will be known as the DePrez Ice & Fuel Co. and will continue the high standards of service of the DePrez company.

Princeton, Ky.—The Citizens Ice Co. Inc., has been purchased by H. Rodgers Robertson from Tudy L. Cantrel. Mr. Robertson who was associated with the Mayfield Coal & Ice Co. for more than 20 years sold his interest in the Mayfield plant prior to purchasing the Citizens organization.

St. Charles, Mo.—Sale of the St. Charles Ice & Coal Company to Lawrence Austerschmidt by Norbert Wilmes has been announced. The business will now be known as the Austerschmidt Coal Co. The sale ends a fifty year old business that at one time was the biggest coal and ice business here.

Olean, N. Y.—The cold storage plant of Riley and Wands Company, 420 N. Union St., has been leased by a group of local business men it was announced recently. Operating under the name of the Crosby Cold Storage Co. Inc., the group is headed by Howard A. Crosby.

Hillsboro, Ohio — George Farmer has purchased the Hillsboro Ice Delivery from C. H. Stevenson. The business will be known as the Town and Country Ice Delivery.

Crescent, Okla.—The M & D ice plant is to be sold to satisfy creditors, it was learned recently.

Portland, Ore.—The Beaver State Meat company has purchased the former Armour & Co. building at 401 N. W. 13th Avenue which the firm has occupied since 1947. The 50 by 100 foot structure is made of brick and has three stories and basement, with trackage. It has two floors of refrigerated space and loading docks.

Seaside, Ore.—John Davidson, formerly of Camas, Wash., has purchased Beach Distributors which handled frozen foods in the area between Astoria and Tillamook. Its chief line is Honor brand.

Danville, Pa.—The Peter's Ice Plant here has been purchased by Lorie B. Yeager. The name of the plant will be changed to the L. B. Yeager Ice Plant.

Greenville, Pa.—Sale of the Greenville plant and property of the Sharon Coal and Ice Co., 324 Main St., was announced recently. The property and business has been purchased by Mr. and Mrs. Herman F. Stegkamper, of this city. Robert B. Biggin, who has been manager of the concern for the Sharon owners will continue to operate the business under a five-year lease obtained from Mr. Stegkamper, and will operate under the name of the Greenville Frozen Foods.

Grandview, Wash. — Libby, McNeill and Libby, food canners and processors, have started operations here in a freezing plant which was operated last season by Cedargreen and purchased in February of this year by the Libby Company.

I & R—Glen 8x on 9 13 ems May 16

Book Review

HEATING, VENTILATING AND AIR CONDITIONING GUIDE, 1951 edition. Published annually by American Society of Heating and Ventilating Engineers. 1456 pages. Blue cloth binding. Illustrated. Price $7.50. For sale by Nickerson & Collins Co., Chicago 44, Ill.

The largest technical data section to date will be found in the Heating, Ventilating and Air Conditioning Guide for 1951. 24 pages are added to the Technical Data Section and an even greater quantity of new material was added in space saved by concentration and condensation of previous technical text. The arrangement of chapters remains the same as in the preceding edition. While the entire book has been examined to bring the technical data in agreement with the current practice, a number of additional changes and revisions have been made. These changes and revisions affect practically every chapter in the book. As usual, a detailed cross-index to the text is provided for the technical data section. This edition continues the established policy of providing technical and practical engineering information, on all phases of heating, ventilating and air conditioning work. The data presented is concise, complete, authentic and easy to read.

New Incorporations

Golden Meadow, La.—Martin Ice Corp. filed articles of incorporation recently. Capital stock was listed at $50,000.

Winnfield, La. — Independent Ice Company, Inc., has filed articles of incorporation listing capital stock at $25,000.

Bay City, Tex.—The City Ice Company has been incorporated with $10,000 capital stock. Incorporators are Bretch Taulbee, E. L. McDonald and A. P. Taulbee.

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Refrigeration Essential Say Food Processors

SEVEN major food processing and storage industries have cooperated in the preparation and publishing of a brochure entitled "What Price Food Preservation." These industries, responsible for the major portion of the nation's food supply, are heavily dependent on refrigeration. The brochure, a composite of statements by the several industries, tells the story of the vital need for refrigeration in the continued operation of these key industries.

This 16-page publication, illustrated and printed in two colors, is designed primarily for use in discussions with the various government agencies directly concerned with national defense matters. The brochure is also expected to have much value in reviewing materials, manpower, and other operating requirements with the field offices of government agencies.

The food processing and storage industry trade associations which jointly sponsored the brochure in cooperation with the Air Conditioning and Refrigerating Machinery Association, representing the refrigeration equipment manufacturers, are: American Meat Institute, International Association of Ice Cream Manufacturers, Milk Industry Foundation, National Association of Frozen Food Packers, National Association of Ice Industries, National Association of Refrigerated Warehouses, National Fisheries Institute.

Fires and Accidents

Fontana, Calif.—Fire of undetermined origin recently swept the former packing house of the Fontana Citrus Association. The fire apparently started in the southwest corner of the basement where refrigeration equipment had been used by the packing house.

Los Angeles, Calif.—Smoking ammonia fumes from a shattered underground refrigeration line of the California Consumers Corp. in downtown Los Angeles, drove office occupants to the street. The California Consumers Corp. supples hotel and restaurant refrigeration systems throughout the city.

Brunswick, Mo. — Slight damage was done to the ice plant and locker building of the Brunswick Coca-Cola Bottling Co., when fire was located in one of the partitions on the first floor.

Fulton, Mo.—Fire in the insulation over the storage room of the Fulton Ice Plant caused slight damage. Firemen said the blaze was caused either by an overheated motor or wiring.

Muskogee, Okla. — Greer Packing Co., was damaged recently by a fire which originated in the smokehouse. T. B. Greer, Jr., owner, estimated damage at $12,000.

Canadian Ice Machine

CANADIAN ICE MACHINE CO. had a net profit of $55,031, equal to 65 cents per share of common for 1950, compared with $45,490 and 51 cents a share for 1949. The high level of sales achieved during the latter part of the year 1950 has continued during the first quarter of 1951, president H. V. Shipley said.

CONVENTION CALENDAR

NATIONAL ASSOCIATION OF ICE INDUSTRIES

November 12-16, 1951
Shamrock Hotel, Houston, Tex.
GUY W. JACOBS, Exec.-Secy.

CANADIAN ASSOCIATION OF ICE INDUSTRIES

November 22-24, 1951
Royal York Hotel, Toronto, Ont.
Mrs. MILDRED CROFT, Secretary

DELTA STATE ICE ASSOCIATION

December 3-5, 1951
Buena Vista Hotel, Biloxi, Miss.
R. N. MILLING, Secretary

MISSOURI VALLEY ICE MANUFACTURERS ASSOCIATION

January 7-9, 1952
Hotel President, Kansas City, Mo.
V. A. ESPHORST, Secy-Treas.

ASSOCIATION DIRECTORY

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H. T. McDermott, Gen. Secretary, 433 N. Waller, Chicago 44, Ill.

NATIONAL ASSOCIATION OF ICE INDUSTRIES
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NATIONAL ASSOCIATION OF REFRIGERATED WAREHOUSES
Wm. Dalton, Exec. Vice-Pres. — Tower Bldg., Washington 5, D. C.

NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATING ENGINEERS
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CANADIAN ASSOCIATION OF ICE INDUSTRIES
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317 Eglinton Ave., Toronto, Canada

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R. N. Milling, Secretary
Ouachita Bank Bldg., Monroe, La.

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Muriel Washburn, Secretary
1926 Silver St., Jacksonville, Fla.

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Clinton Pure Ice Co., Clinton, Ill.

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Board of Trade Bldg., Indianapolis, Ind

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Manhattan Ice & Cold Storage Co.,
Manhattan, Kans.

KENTUCKY ICE MANUFACTURERS ASSOCIATION
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429 S. Seventh St., Louisville, Ky.

MICHIGAN ICE INDUSTRIES ASSOCIATION
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131 E. Kalamazoo Ave., Kalamazoo, Mich.

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3820 Washington St., St. Louis, Mo.

MOUNTAIN STATES ASS'N OF ICE INDUSTRIES
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Espy Ice Co., 2229 - 15th St., Denver, Colo.

NEBRASKA ASSOCIATION OF ICE INDUSTRIES
Frank Vogelsang, Secretary
W. T. Good Ice Co., Lincoln, Nebr.

NEW ENGLAND ICE ASSOCIATION
Raymond Wilber, Secretary
83 Winter St., Providence, R. I.

NEW YORK STATE ASS'N REF. WAREHOUSES
Chas. G. Ashe, Secretary
101 Columbia St., Buffalo 5, N. Y.

NORTH CAROLINA ICE ASSOCIATION
Lewis H. Powell, Secretary
Capital Ice & Coal Co., Raleigh, N. C.

NORTHWEST ASSOCIATION OF ICE INDUSTRIES
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1539 N. E. 37th Ave., Portland, Ore.

OHIO ASSOCIATION OF ICE INDUSTRIES
Elizabeth Shannon, Acting Secy.-Treas.
The Steubenville Ice Co., Steubenville, O.

OKLAHOMA ASSOCIATION OF ICE INDUSTRIES
Harry T. Hudson, Executive Secretary
708-9 Perrine Building, Oklahoma City, Okla.

PACIFIC STATES COLD STORAGE WAREHOUSEMEN'S ASSOCIATION
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461 Market St., San Francisco, Calif.

SOUTH CAROLINA ICE MANUFACTURERS ASS'N
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P. O. Box 603, Columbia, S. C.

SOUTHERN ICE EXCHANGE
Richard W. Florrid, Secretary
11½ Forsyth St. N. W., Atlanta, Ga.

SOUTHWESTERN ICE MANUFACTURERS ASS'N
P. A. Weatherred, Secy. Counsel,
Mercantile Bank Bldg., Dallas, Tex.

TENNESSEE ICE MANUFACTURERS ASSOCIATION
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Mt. Pleasant Ice Co., Mt. Pleasant, Tenn.

TRI-STATE ASSOCIATION OF ICE INDUSTRIES
L. R. Girton, Secretary
260 Boyce-Greeley Bldg., Sioux Falls, S.D.

VIRGINIA ICE MANUFACTURERS ASSOCIATION
H. H. Snyder, Secretary
Alexandria, Va.

WEST VIRGINIA ASSOCIATION OF ICE INDUSTRIES
E. Dana Smith, Secretary
Diamond Ice & Coal Co., Charleston,
W. Va.

WISCONSIN ASSOCIATION OF ICE INDUSTRIES
Paul F. Hoff, Secretary
1300 East Locust St., Milwaukee, Wis.

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It uses Niagara No-Frost Liquid Spray to keep frost and ice from ever forming. It gives you, automatically, refrigeration with no defrosting, and full capacity NEVER cut down by ice building up progressively on refrigeration coils.

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This gives you more refrigeration at lower cost; less machinery in less space. You operate at high suction pressure, saving power and wear and tear on compressors.

The extra capacity and lower cost both for equipment and operating makes this method advantageous for every type of refrigeration use—both for freezing and for moderate temperatures—for large "live" loads as in meat chilling or in fruit and vegetable precooling — for rooms that are filled and emptied of product daily, such as milk rooms and terminal storage warehouses.

You get true trouble-free refrigeration . . . No brine . . . no salt solution . . . no dirt . . . no mess . . . It is entirely clean; you get rid of dirt and odors. You reduce both equipment and operating costs.

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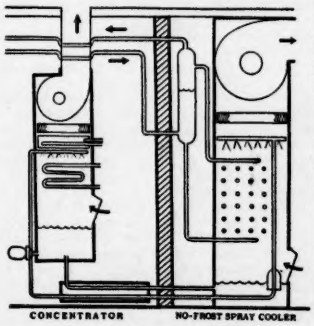

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NEW PLANTS and IMPROVEMENTS

This Department each month presents the more important developments covering new constructions, as well as additions, improvements, remodeling, and installations of new equipment in ice and cold storage plants and other industrial plants that use refrigeration. News notes on all such new constructions and improvements are invited.

California

Patterson, Calif.—The newly remodeled and enlarged Patterson Frozen Foods plant is processing broccoli, spinach and cauliflower raised in the surrounding countryside. The floor space of the plant was doubled and much new equipment installed. Additions include two complete process lines, two new compressors, and 60,000 feet of refrigeration coil pipe. The plant has storage capacity for 90 carloads of frozen foods.

Reedley, Calif.—The Royal Valley Fruit Growers Association recently became a new fruit packing organization when it took over the property and operations of the California Fruit Exchange. The company has contracted for building of a new 25-car capacity cold storage plant on which work was recently started. The Associated Engineering Co. is the contracting firm. The plant will use ice as a cooling agent, like the one built last year by the Kennedy-Stewart Co.

Cupertino, Calif.—Hartman Ranch located on Homestead Road near here has installed freezing and cold storage facilities in connection with its processing plant.

San Luis Obispo, Calif.—A new storage dock is being constructed at a cost of approximately $4,000 by the San Luis Ice & Cold Storage Co.

Sanger, Calif.—Barr Packing Company has started construction of a complete new cold storage and packing house. The existing house will be sold and converted to warehousing. The new structure 94 by 520 ft. will contain cold storage and precooling rooms at the north end and offices at the east end. The cold storage department will have a holding capacity of 100 cars of grapes with mezzanine floor provided for the processing and packing of export grapes. Thos. C. Kendall of Los Angeles is the architect of the new plant.

Santa Cruz, Calif.—The Walti-Schilling packing plant on the Coast road at the city limits announced they are spending about $350,000 for expansion. Plans call for a new killing floor and two new coolers.

Santa Cruz, Calif.—A building permit was taken out for the $120,000 Santa Cruz Artichoke and Brussels Sprout Growers' Association plant at 430 Ingalls St. Bridges Construction Co., San Jose, was awarded the contract. The old plant of the growers has been leased to General Foods Corp.

Florida

Lorida, Fla.—A Miami concern will construct a meat packing plant here. About 100 persons will be employed at the plant when in full operation.

Illinois

Chicago, Ill.—Another Sturdy-Built vending station has been delivered to the Fulton Pure Ice Co., 7400 South Ada Street.

Springfield, Ill.—The Central Illinois Ice Co. recently installed three Sturdy-Built Fuel vending machines.

Louisiana

New Orleans, La.—New Sturdy-Built ice venders have been installed by the Claiborne Ice Co.

Mexico

Mexicali, Mexico—Plans are being completed for a new building 50 by 112 ft to contain empty barrel storage, filled barrel cooler storage and racking room for the Mexicali Brewing Co. Building will be all concrete to truck height with brick exterior walls, mill type roof and corkboard insulation. Preliminary plans are being worked out for a complete new 300 barrel brewhouse. The existing brewhouse originally built for 50 barrel capacity will eventually be reconstructed into cellars. S. E. Berkenblit Co. of Chicago have been retained as equipment and process engineers. A new all steel and brick warehouse, 150 ft by 180 ft will be built for general dry storage. Construction has been completed on a new brick and reinforced concrete boiler house and machine room. Thos. C. Kendall, Los Angeles, is design engineer for the brewery.

Mississippi

Jackson, Miss.—C. A. Roper is building a wholesale fruit and vegetable cold storage facility to cost $111,000 with contract let to Campbell Construction Co. The building is to be located between Guidici Street and Highway 80.

Missouri

St. Louis, Mo.—The Merchants Ice & Coal Co., has installed a Sturdy-Built Fuel vending machine to vend 50 pound packages of coal.

Nebraska

North Platte, Nebr.—The Artificial Ice & Coal Co. recently installed an ice crusher-slinger and is now in position to ice trucks carrying perishables.

New Jersey

Jersey City, N. J.—The Pure Ice & Cold Storage Company has completed a new wholesale warehouse, the cost of which was placed at $200,000. The building was erected chiefly to fill storage space requests of produce men and has a floor space of 20,000 sq ft. The refrigerated warehouse facilities consist of about 700,000 cu ft of which 200,000 cu ft are devoted to sharp freezers for frozen products. The company also supplies pipeline refrigeration to various industries connected with its properties and manufactures ice also.

New York

Binghamton, N. Y.—The Binghamton Cold Storage Co. has acquired the refrigerated warehouse facilities and the name of the Binghamton Refrigerating Co., Inc. More than 34,000 cu ft of freezer space has been added to existing facilities. Among other features of the company's modernization and expansion program are the installation of new handling equipment and break-up and customer-tenant space.

Geneva, N. Y.—Sturdy-Built block and package ice vending machines are now in operation at the dock of The Ice Company in Geneva.

Ohio

Cincinnati, Ohio—Home City Ice Company has installed a new Sturdy-Built 25-pound package ice vender in their plant.

Texas

Dallas, Tex.—The Pure Ice & Cold Storage Company here recently completed a new $200,000 wholesale produce warehouse building with 20,000 square feet of floor space. The building has cold storage facilities of 700,000 cu ft of which 200,000 are for frozen products and the rest, at a lower temperature, for fresh fruits and vegetables. The company has facilities for manufacturing up to 70 tons of ice per day.

Hallettsville, Tex.—Plans for construction of an ice manufacturing plant here were announced recently by the General Service Co. The newly-organized company plans to build other plants throughout the state. The company is headed by John J. Gannon, certified public accountant, with Mrs. J. J. Gannon and L. Cletus Brown Jr. holding other posts. All three are from Houston.

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Show your customers this insulated, waterproof ice basket and they buy on sight.

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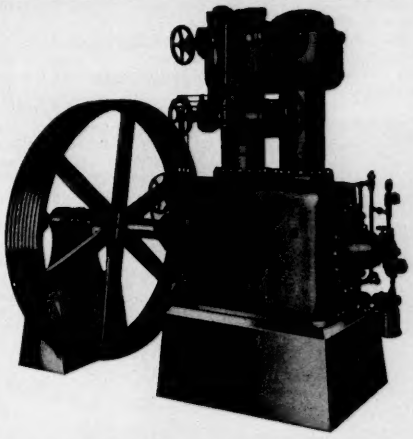

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DEATHS

Edward A. Rogerson

THE death of Edward A. Rogerson, identified for many years with the Rogerson Cold Storage Co., Le Roy, N. Y., occurred April 15 at his home in Le Roy. Mr. Rogerson, who was 72 years old had been in failing health for several years.

Edward A. Rogerson

Mr. Rogerson was born in Le Roy and had been a lifelong resident of that city. He was well known among refrigerated warehousemen in New York State as secretary and treasurer of the New York State Cold Storage Association for many years. He also took an active part in church and community affairs. His public service included 35 years as a member of the Board of Education and as a library trustee of the Woodward Memorial Library. He was a leader of the Le Roy Business Association and for some years was a trustee of Macpelah Cemetery Association.

LEWIS M. ABBOTT, 60, president of the Granite City Cold Storage Corp., 170 Penn St., Quincy, Mass., was fatally stricken March 30 as he sat at the wheel of his car outside the plant. Mr. Abbott was a native of Boston. He was a past president of the Furnace Brook Golf Club and a member of the Wollaston Golf Club. He leaves his widow, Mrs. Winifred Abbott and two daughters, the Misses Betsy and Lois; and a brother, Lawrence H. Abbott of Quincy.

THOMAS YOUEN, an ice dealer in Erie, Pa., for 50 years prior to his retirement, died April 25 at the age of 95. A daughter survives.

Willshire Riley

THE death of Willshire Riley, former secretary of the Georgia Ice Manufacturers Association and of the Southern Ice Exchange, occurred May 9 in a private hospital in Atlanta, Ga. He was 84 years old.

Mr. Riley for many years was secretary of the two ice associations, retiring from these positions in 1950. He came to Atlanta in 1913 and was general manager of the Atlantic Ice & Coal Company for 20 years. He was a member of the Georgia Manufacturers' Association, the Presidents' Club, the Atlantic Athletic Club and was a Methodist. Surviving are his widow and one grandson.

Arthur A. Wallace

THE death of Arthur A. Wallace of the Boonville Ice & Storage Co., Boonville, Mo., occurred Sunday, May 13. He was 80 years old. Mr. Wallace had operated the plant at Boonville since 1907. He was an active member of the Missouri Valley Ice Manufacturers' Association and was well known throughout the Missouri ice industry.

JOSEPH LA ROCHE, founder of the La Roche Ice Co., West Warwick, R. I., died March 30 at a Providence hospital following a short illness. He was 65 years old. After operating the ice company for 39 years he retired in 1948. He was born in St. Giullaume, P. Q., Canada, but had been a resident of the Pawtuxet Valley for 63 years.

BOYD E. MCCRARY, father of T. E. McCrary, vice-president and general manager of the Memphis (Tenn.) Cold Storage Warehouse Co., died at his home in Senatobia, Miss., April 1 at the age of 79 years. During most of his active business life he was in the mercantile business in the Mid-South. He retired in 1936.

HENRY F. CROWE, an employee of the Beare Bros. Ice & Coal Co., Jackson, Tenn., for 15 years, died March 3 at his home in Jackson. He was 77 years old. Mr. Crowe had been in poor health for several weeks but his death resulted suddenly from a heart attack. He had been retired for the past 12 years.

BERNARD SANTAMARIA, 59, a pioneer in the ice business in Buffalo, N. Y., died April 23. Born July 24, 1891, in Campbello di Licata, Italy, Mr. Santamaria migrated to Buffalo in 1912 and entered the ice business in 1922. His first establishment was at 151 Virginia St. and he delivered from door to door in a horse-drawn wagon. Later he was located at 460 Rhode Island St. and 268 Chenango St. He retired in 1947 because of illness.

J. B. McAfee

THE death of J. B. McAfee, formerly secretary-treasurer of the Consolidated Ice Co., Pittsburgh, Pa., retired since March, 1951, occurred suddenly May 4. Mr. McAfee had been with Consolidated Ice continuously since May, 1906. He was also secretary-treasurer of the Consolidated Storage Company and secretary of Diamond Ice Co.

He retired to his new home at Amity, Washington County, Pa., which was erected on part of the farm where he was born, and had a commanding view over the surrounding countryside so familiar to him. He was 68 years of age. He was a trustee of Crafton Heights Methodist Church, member of the Lions Club and Pittsburgh Chamber of Commerce. He is survived by his wife, Pleasy Walker McAfee.

The services were held at Gulph Mill Church, near Amity, and attended by his many friends and associates, and burial in the church cemetery in the rear of the church. The services amid the rural background were impressive and a tribute to a great life.

During his years with Consolidated Ice Co., he was associated with many of the pioneers in the ice industry—Thomas A. Dunn, Capt. T. M. Rees and Frank L. Duggan.

ORLO M. CRANNELL, chief engineer of the Lynn, Mass., ice plant of the Boston Ice Company for the last nine years, died April 1 at a Malden Hospital after a brief illness. A native of Worcester, Mr. Crannell had lived in Malden for 17 years.

ARTHUR ROME ROBERTS, Hapeville, Ga., associated with the Atlantic Ice Company until his retirement, died May 1 at a local hospital. He was 64 years old. He is survived by his widow and six sons.

NAPOLEON B. JACKSON, 59, president of the Jackson Ice Company at St. Petersburg, Fla., and the All Season Ice and Fuel Company at Jacksonville, died at his home at Jacksonville, February 25. He had been ill some time.

ROY OLIVER YAUSIE, 54, superintendent of the Cataract Ice Company, Niagara Falls, Ont., died February 14. He had been a resident of Niagara Falls for 26 years. His wife and a daughter survive.

WILLIAM H. HOLMES, 82, president and general manager of the Scranton Cold Storage Co., died May 11 in Scranton, Pa., after a long illness. He had resided in Scranton for 21 years. A daughter survives.

Steam Baked

Reliable
TRADE MARK
Corkboard

- 30 years serving the Refrigeration, Cold Storage, Meat Packing Industries, and Ice Plants.
- Prompt shipments anywhere.
- Your inquires invited!

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CHICAGO 22, ILLINOIS
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FAST, ECONOMICAL CRUSHER SAVES TIME, LABOR COST!

The new and fast-operating "Little Chief" Ice Crusher by Bateman has three grate adjustments and will grind a 25-pound block of ice into fine ice in 12 seconds; into medium ice in 8 seconds, and into coarse ice in only six seconds.

It holds snow to an absolute minimum, is galvanized and has a chute for filling bags. It is simple—and dependable. There are no gears since drive is direct from two-groove flywheel.

Because of high grinding speed, the "Little Chief" operates from a ¾ H.P. motor. If desired, motor will be provided at prevailing price.

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$149.00
Less Motor
FOB Mineral Wells

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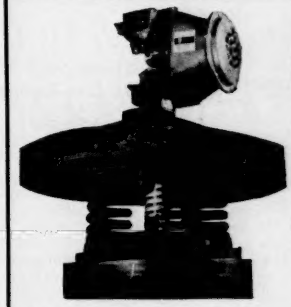
Ice Processing Equipment
MINERAL WELLS, TEXAS



DON'T LOOSE YOUR HEAD!
Use— Safety Head Control

No Compressor Destroys Itself Without First Raising It's Own Head

The Automatic Safety Head Control may be applied to any vertical refrigeration compressor that has a safety head. The Safety Control is operated by the lifting of the safety head as a result of broken valve or screw, carbon build-up, loose connecting rod, or a slug of liquid.

As the safety head lifts, a stainless steel push rod operates a micro-switch which may be connected to the main power control and also through the liquid line solenoid and an alarm system.

Compressors with Safety Head Controls installed are protected against blown out heads. Packing around the push rod is special high temperature and high pressure V-type.

Write for Bulletin

SAFETY HEAD CONTROL CO.
3759 S. Damen Ave. Chicago 9, Illinois

DIMCO CAST ALUMINUM FIN EVAPORATING COIL

★ *Saves Space*
★ *Saves Weight*
★ *Saves Cost*

CAN BE USED WITH ANY REFRIGERANT
SALES AGENCIES SOLICITED

Manufactured by
DETROIT ICE MACHINE COMPANY
2615 Twelfth St., Detroit 16, Mich.

DIMCO Fin Coils solve low headroom problem
View of Mezzanine Lard Storage Room
Peters Sausage Company, Detroit, Mich.

What's New

MACHINERY APPLIANCES • PROCESSES

Safety Head Control

A DEVICE to stop refrigerant compressor, shut off liquid feed, and sound a warning is being marketed under the name of "Safety Head Control." It is applicable to any ammonia or Freon compressor.

Blowing the heads out of compressors is not something that just may happen but does, and much too often in refrigeration operation. We are faced with war curtailments now, parts are back ordered for months, even in cases of emergency. It is a drastic situation for any company to find themselves in and absolutely unnecessary now that there is a safety control that will save the compressor from any possible damage, the manufacturer declares.

True, the machines do have a safety head, but this is not sufficient. When a fillister head screw from cage of suction valve breaks, a valve stem snaps, a slug of liquid, a loose connecting rod bearing, you know that no compressor destroys itself without first raising the safety head, and here, without fail, the safety control shuts off the compressor. Naturally, this takes the burden from the operator's shoulders, the manufacturer adds.

The equipment is manufactured by the Safety Head Control Co., Chicago, Ill.

Acme Makes Refinements On Dry-Ex Liquid Cooler

A NUMBER of refinements on the Acme Dry-Ex Liquid Cooler are announced by Alwin B. Newton, Vice-President of Engineering at Acme Industries, Inc., Jackson, Mich. This is a unit which is used to cool liquids such as water, brine, oil, alcohols, glycols, etc., and which has capacities of up to 200 tons of refrigeration.

A steel pipe nipple is now being welded to the cast steel refrigerant head. The advantage of this connection is that it serves to eliminate a gasketed joint which was previously inaccessible. The connection is reamed out on the end to fit the O.D. of copper tubing. Since the test cap is silver soldered in place, it may be removed and the field connection made in one heating operation when a copper suction or liquid line is to be silver-soldered to the chiller connection. Thirdly, field connections may be made of steel pipe or tubing welded directly to the nipple on the chiller, which is previously scarfed for welding. This is especially advantageous today with the present shortage in some localities of copper tubing for field use.

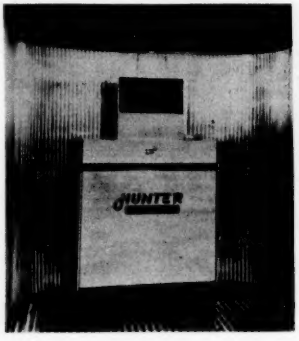
Dry-Ex Chillers will be furnished with the old flanged type construction of refrigerant connections to balance out the present inventory of machine castings. They will then be furnished with the improved type of connection.

Cargo Cooler Uses Dry Ice to Provide Uniform Temperatures in Truck or Trailer

THE Hunter cargo cooler weighs 300 lbs. and extends 19 inches from the front wall. The system uses ice under the control of a thermostatically governed air circulation system to provide uniform temperature through and around all parts of the cargo. According to the manufacturer the system is capable of holding any specified temperature between zero and 60 F.

The unit which is welded aluminum is bolted to the floor in the nose of the truck or trailer. It is 75 in. higher, with finned exterior walls providing over 12,000 sq. in. of supercold surface for absorption of heat from a controlled, circulating air stream. Located in the unit are two air-foil type, axial flow, electric fans of low power requirement which are powered by the tractor's battery. These blowers, available for either 6 or 12 volt battery systems, direct and control the air stream in such a way that the entire cargo is continually wrapped in a blanket of circulating refrigerated air under control of the thermostat located in the rear of the cargo space. The system, it is said, moves more than 800 cu. ft. of cold air through and around all parts of the load during the refrigerating cycle. Carbon dioxide resulting from dry-ice melting may be vented to the outside or to the cargo space as desired.

The cargo cooler will hold twelve 50 lb. blocks of dry ice on three shelves which are directly connected with its finned surfaces. Dry ice is loaded through an access door in the side of the vehicle. An accessory 110-volt standby power unit is available for operation of the cargo cooler independent of the vehicle battery during layovers, emergencies, etc. Hunter combination units, incorporate both cargo cooler and cargo heaters.



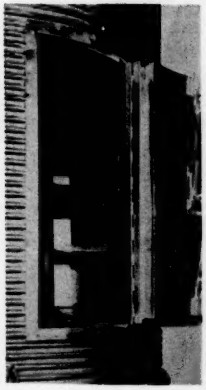


Fig. 1—Left. The Hunter cargo cooler weighs 300 lbs. and utilizes controlled circulation of dry-ice-refrigerated air for thermostatically governed temperature maintenance.

Fig. 2—Above. Hunter cargo cooler's forced-air circulation system, as shown wraps cargo in a blanket of circulating refrigerated air.

Fig. 3—Right. Access door in vehicle wall permits loading of dry ice without entering cargo section. Bunker's three shelves hold twelve 50 lb. blocks of dry ice.

NOZZLES • DROP TUBES • CAN DOGS • CAN FILLERS • BLOWERS • BRACKETS • BAGS • HOISTS

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VERTICAL TURBINE PUMPS

QUALITY COILS FOR ALL APPLICATIONS

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Coils are of selected ammonia pipe—all joints are electrically welded—checked under water with an air pressure of 300 pounds to guarantee tightness.

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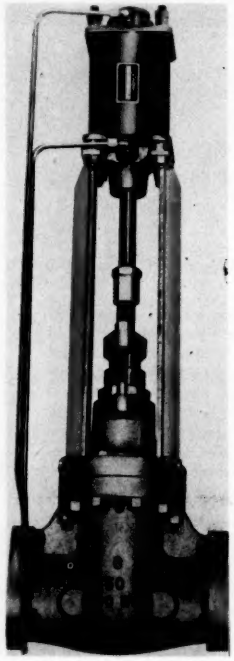
CHICAGO NIPPLE MFG. CO.
1997 Clybourn Ave., Chicago 14, Ill.

Ledeen Announces New Valve Actuators

DESIGNED for the operation of gate valves, plug valves, dampers, diaphragm valves, butterfly valves and sluice gates, and developed as a standard product, is a line of valve actuators, introduced by Ledeen Manufacturing Co., Los Angeles, Calif. The firm also builds a line of actuating cylinders for air, oil, water or steam operation, and a line of valves for actuating this type of cylinder.



New Ledeen Actuator

Ledeen valve actuators are basically Ledeen cylinders, equipped with brackets, valves, controls, and couplings to make them suitable for almost any type of operation required. They can be adapted to any make, size, and type of valve; to operate against any line pressure; to work on any fluid medium, and with any pressure available. They can be arranged for on-and-off service, or for positioning service. They are characterized as simple in construction, positive in action, economical in cost, fireproof, explosion-proof and fool proof.

Bulletin 512 shows typical valve actuator circuits, capacities of valve actuators and details of construction, application and control.

New Insulated Corrugated Container for Frozen Foods

ALOW cost, light weight, Fiberglas-insulated corrugated container in which frozen foods may be carried safely up to 12 hours, without refrigeration has been developed by the Owens-Corning Fiberglas Corp. known as the Transafe, the product consists of a standard, slotted, corrugated container whose top, bottom, sides and ends contain one-inch-thick slabs of Fiberglas insulation.

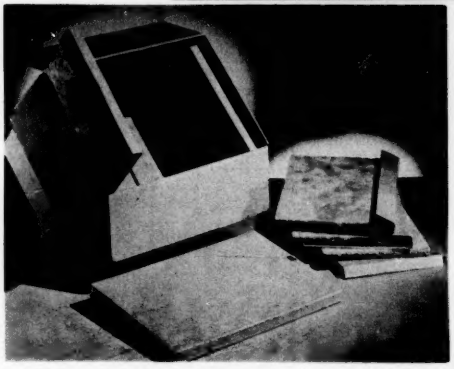
The Transafe is expected to be widely used in the transportation of frozen foods from local distributing warehouses to retail stores, restaurants, hotels, clubs and other institutions. It also serves as a temporary back room storage facility for frozen food packages which may exceed the capacity of store display cases on heavy shopping days. Retailers sell "specials" directly from the container on the floor without resorting to the regular retail refrigerated cabinets.

The Transafe, developed with the aid of warehousemen, is made in a number of sizes. Two standard sizes are recommended, one to hold a single carton of 24 packages of frozen food and the other two cartons or 48 packages. It may be re-used many times. After long service the outer carton when worn beyond practical use may be replaced with a new one. However, the Fiberglas insulation and the liners may be re-used.

The new product is light in weight, (the larger of the two recommended sizes approximates 5 pounds) and is easy to handle. It is estimated that the 48 unit size will cost about $1.75.

Assembly of the Transafe is simple. The container manufacturer furnishes container parts, printed, scored and folded to exact specifications. The fabricator cuts the insulation to size from standard 24 by 48 inches by one-inch thick sheets with a knife and straight edge or on a band saw. Virtually no insulation waste will occur since any left over pieces may be combined to form an end or side panel.

Broken cartons or loose units of frozen foods may be shipped safely and economically in the Transafe, Fiberglas-insulated corrugated container.



The carton and component parts of Transafe are fabricated and insulation placed behind liners. Two or more pieces may be used for end piece or side panel.

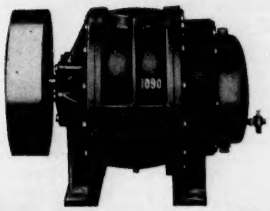
Tests have indicated that the container, without pre-chilling, will hold frozen food at temperatures of minus five degrees to zero degrees up to six hours in an atmospheric temperature of 100 degrees and a relative humidity of 75 per cent. In temperatures of 70 to 75 degrees the period may exceed 12 hours.

Specifications of the Transafe may be obtained by writing Transportation Division, Owens-Corning Fiberglas Corporation, Toledo 1, Ohio.

CURES
V-P-L WEATHER WORRIES!

In hot June or cold December, you can count on positive Volume at required Pressures and Low power cost from R-C Rotary Positive Blowers. Since the first raw ice plant was built, these simple, sturdy units have proved their reliability and economy. Ask us about your needs or write for free Bulletin 21-B-37.

Roots-Connersville Blower Corporation
510 Columbia Avenue, Connersville, Indiana



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SHARP FREEZERS • ICE BUILDERS

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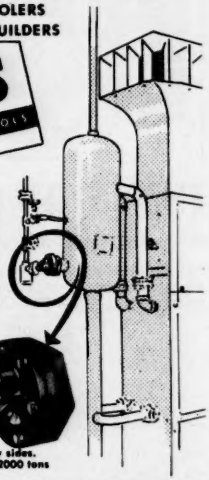
FLOAT CONTROLS



Instant response to wide variation in load is one major reason why the use of Phillips Float Controls contributes to high heat transfer efficiency in practically all cooling units. In addition, you gain maximum flexibility with a fewer number of valves to carry in stock because Phillips No. 300 and No. 301 Valves provide capacities of 2 to 50 tons for handling a majority of applications with the same mounting.

For complete satisfaction in Float Controls and Regulating Valves, combined with efficient engineering service help—willingly given—call on Phillips.

No. 300 and 301 Valves have Cartridge Construction: Direct Feed—7 orifice sizes; Remote Feed—8 orifice sizes.

Other Control Valves for high or low sides. Freon: 1 to 1000 tons, Ammonia: 1 to 2000 tons

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SOLD THRU THE NEW
"TAKE-A-PICK" MASTER POINT PICK VENDOR
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HALSEY MFG. CO., Evansville 2, Ind.

Vending Machine Sells Coal and Charcoal

AN INNOVATION in coin vending machines has been introduced and is now in operation by Merchants Ice & Coal Company, St. Louis, Mo. The machine is the first of its kind in St. Louis, and is located at 1721 South Vandeventer Avenue. It will vend a nut sized coal packaged in paper bags, during the winter months, and charcoal, also in paper bags, during the summer months.

The vender was installed for the convenience of the general public to provide service at any hour of the day or night. During the summer months, the vender will be of service to last minute picnickers and fishermen, especially on Sundays when other sources of supply for charcoal are closed. The machine will be serviced as necessary, depending on its sales, assuring a constant supply.

Customer buys a bag of coal.

Easier and Cheaper with

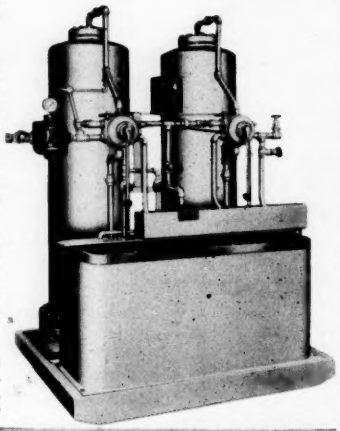
INDUSTRIAL Water Demineralizer

It's worth looking into . . .

The demineralization of water is not something new. It is used in the food industry, in the chemical and other industrial processing where chemically pure water is used in quantity. The very low cost warrants your looking into it.

Here are some of the advantages you get with an INDUSTRIAL demineralizer in ice making. Since the dissolved mineral salts in ordinary water are removed in passing through the ion-exchange resins, core-water removal and replacement is unnecessary. Losses due to cracking are greatly reduced. Freezing at the lower brine temperature increases daily yield. And the bulk of the cake of ice is clearer—your customers will notice that.

If you will send us an analysis of the water you are using, the quantity you need, and at what rate (gallons per hour) we will send you information on INDUSTRIAL demineralizers, estimate of costs, performance data, etc. Better do it now.



A typical two-bed INDUSTRIAL Water Demineralizer. Standard models available with capacities up to 1000 gph. Special units of any capacity engineered to requirements.

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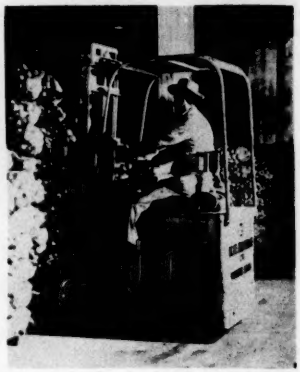
RUBBER DIVISION
Vulcanized Linings • Molded Products

WATER
DEMINERALIZERS

Handling of Food Packages Speeded with Power Trucks

FOUR men equipped with four small Elwell-Parker battery-powered fork trucks do the continuous, heavy-load handling in a Vancouver, B. C., cold storage plant and distribution center. The same work with manually operated equipment required 15 to 20 men. Conservation of manpower by means of mechanical equipment is a factor of increasing importance as national defense operations gain momentum. Speed, economy, cleanliness result from the use of these trucks which being battery-powered eliminate the hazard of food contamination by oil and gas in closed areas. For these reasons the company preferred American-built electric trucks despite the fact tariff regulations favored other types.



Fork truck storing pallet-loads of onions, forty 50-pound sacks on a pallet. This truck with operator and two men who work in freight cars placing the sacks on pallets unload and store four carloads of onions, 72 tons, in eight hours.

Longer Life for Pallets

LONGER life for pallets is the claim of Fungitrol Chemicals, Inc., of Hillside, N. J., when they are treated with the company's new preservative, Cellu-san. According to the company, pallets treated with this material can "withstand rougher handling, are free from any residual odor and are protected from mold and mildew attack . . ."

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will relieve your compressors when they need it most.
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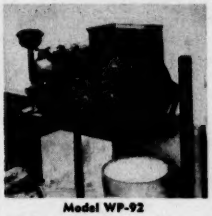
LITTLE GIANT ICE BREAKERS
TRUCK MODEL—GAS ENGINE DRIVEN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MANUFACTURERS' NEWS

York Promotes Executives

THE appointment of W. R. Eby, a native of Oakland, Calif., as manager of the Pacific district of York Corporation is announced by John R. Hertzler, vice-president and general sales manager. He succeeds Rodney F. Lauer, who was recently elevated to vice-president in charge of engineering and research for the air conditioning and refrigeration firm. With York Corporation since 1930, Mr. Eby had been industrial sales manager of the Pacific district with headquarters in Los Angeles.

Thomas A. Marshall, a native of Alameda, Calif., who was manager of the San Francisco branch office succeeds Mr. Eby as industrial sales manager for the Pacific district. Dow D. Stone, a native of Medford, Ore., has been named branch manager of the San Francisco office, filling the vacancy left by the promotion of Mr. Marshall.

Advantages of VOSS COMPRESSOR VALVES

1. **LARGER GAS PASSAGE AREA** — From 20% to 100% increased valve area handles more and colder gas; a colder therefore denser gas costs less to compress.
2. **LARGER VALVE AREA** — Raises back and lowers head pressure, consequently reduces compression ratio—saving more power.
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5. **LONG LIFE** — Made to the highest standard of workmanship—on special machines—by craftsmen—in a modern and well equipped shop—designed to give long life under the severest conditions.
6. **NOISELESS** — Smooth running—with less power—at higher speeds—without overheating.
7. **ECONOMICAL** — Increased capacity at a definite saving in power—replaces your present valves without any change in your compressor.

DEFINITE SAVINGS after installing J. H. H. VOSS VALVES
REG. U.S. PAT. OFF.

in your compressors

VOSS VALVES are indispensible for use where loads are heaviest; where lower operating costs are important; where safety and reliability are paramount. Increased speed after change over to VOSS VALVES often makes it possible to carry load with one compressor instead of two needed before.

Quotations and estimates on VOSS VALVES furnished on request. Case histories and testimonials of installations similar to your own supplied. Send us the name, bore, stroke and speed of your air, ammonia, or gas compressor of any type or size.

J. H. H. VOSS CO., Inc. 785 East 144th Street NEW YORK 54, N. Y.

Passmore New Manager Armour's Ammonia Division

THE newly created post of general manager of Armour & Company's ammonia division has been filled by the appointment of R. S. Passmore, formerly sales manager of the division, E. W. Wilson, vice president, announced. P. W. Fulford has been named sales manager.

Mr. Passmore, who attended Northwestern University School of Commerce (Chicago), began with the company in 1928 in ammonia sales. He entered military service in 1942 and was released to inactive duty in the rank of Lieutenant Commander U.S.N.R. in 1946. As general manager, Mr. Passmore will be in charge of operations and sales.

Chicago Nipple Names New Sales Manager

THE board of directors of Chicago Nipple Manufacturing Co. has elected R. H. Sonneborn vice president in charge of sales, according to announcement by J. Lester Williams, Jr., president. Mr. Sonneborn has been with the company for the past eight years and was secretary and general manager of sales. Mr. Williams also has announced the election of E. Condit, former treasurer as secretary and treasurer, and A. Preiwisch as assistant secretary.

CATALOGS and BULLETINS

Bulletin Gives Data on Wrought Iron Pipe

TO ASSIST technicians in their design and specification work, A. M. Byers Company has published a 4-page bulletin that contains most frequently required data on wrought iron pipe. Consolidated pipe tables list size and dimensional data for both standard and extra strong pipe. These tables contain complete information on threads per inch, mill test pressures, circumference, external areas, length per square foot of surface area, length per cubic foot, and weight of water per lineal foot. Consolidated, this incorporates the general data needed for heating, flow and weight calculations.

All official specifications for wrought iron are listed. Chemical composition, properties, general applications and special applications of wrought iron pipe are condensed into one page. Also included is a radiant heating conversion chart and formula for use in designing snow melting systems. Copies of the condensed bulletin are available from Engineering Service Department, A. M. Byers Company, Pittsburgh, Pa.

THE BUYERS DIRECTORY

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AIR CONDITIONING EQUIPMENT
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Niagara Blower Co., New York, N.Y.

AMMONIA COMPRESSOR VALVES
Frick Co., Waynesboro, Pa.

AMMONIA COMPRESSORS
Dersch, Gesswein & Neuert, Inc. Chicago, Ill.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

AMMONIA CONTROL DEVICES
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.

AMMONIA FLOAT VALVES
Armstrong Machine Works, Three Rivers, Mich.
Frick Co., Waynesvoro, Pa.
Phillips & Co., H. A., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

AMMONIA MANUFACTURERS
Armour Ammonia Div., Armour & Co., Chicago, Ill.
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Bower Chemical Mfg. Co., Henry, Philadelphia, Pa.
du Pont, Polychemicals Dept., Wilmington, Delaware

AMMONIA MASKS
Acme Protection Equipment Co., Chicago, Ill.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.

AMMONIA PURIFIERS
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

AMMONIA RECEIVERS
Acme Industries, Inc., Jackson, Mich.
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Kehoe Machinery Co., Inc., R. F., Ridgefield Park, N. J.
National Pipe Bending Co., New Haven, Conn.
Rempe Company, Chicago, Ill.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

AMMONIA VALVES & FITTINGS
Acme Industries, Inc., Jackson, Mich.
Dersch, Gesswein & Neuert, Inc. Chicago, Ill.
Shank Co., Cyrus, Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

ARCHITECTS AND ENGINEERS
Greene, Van R. H., New York, N. Y.
Ophuls & Associates, Fred, New York, N. Y.

ASPHALT PRODUCTS
American Bitumuls Co. San Francisco, Calif.

AUTOMATIC CONTROL DEVICES
Alco Valve Co., St. Louis, Mo.
Armstrong Machine Works, Three Rivers, Mich.
Frick Co., Waynesboro, Pa.
Phillips & Co., H. A., Chicago, Ill.

BAGS, ICE
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Index Coupon & Supply Co., La Porte, Ind.
International Paper Co., New York, N. Y.
Union Bag & Paper Corp., New York, N. Y.
United Ice & Oil Supply Co., Boston, Mass.

BAGS, WATERPROOF PAPER
Index Coupon & Supply Co., La Porte, Ind.
International Paper Co., New York, N. Y.
Union Bag & Paper Co., New York, N. Y.

BEER COOLERS
Frick Co., Waynesboro, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

BLOWERS
Frick Co., Waynesboro, Pa.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Martocello & Co., Jos. A., Philadelphia, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

BOILERS
Frick Co., Waynesboro, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

BOILER TUBES
Byers Co., A. M., Pittsburgh, Pa.

BOOKS—TECHNICAL
Nickerson & Collins Co., Chicago, Ill.

BRINE CIRCULATORS
Frick Co., Waynesboro, Pa.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Martocello & Co., Jos. A., Philadelphia, Pa.
Reynolds Mfg. Co., Springfield, Mo.
Roots-Connersville Blower Corp., Connersville, Ky.

BRINE COOLERS
Acme Industries, Inc., Jackson, Mich.
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

BRINE SPRAY COOLING
Acme Industries, Inc., Jackson, Mich.
Frick Co., Waynesboro, Pa.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Martocello & Co., Jos. A., Philadelphia, Pa.

BRINE TREATMENT
Chemical Solvent Co., Birmingham, Ala.

CALCIUM CHLORIDE
Solvay Sales Div., Allied Chem. & Dye Corp., New York, N. Y.

CAN DUMPS
Frick Co., Waynesboro, Pa.
Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.

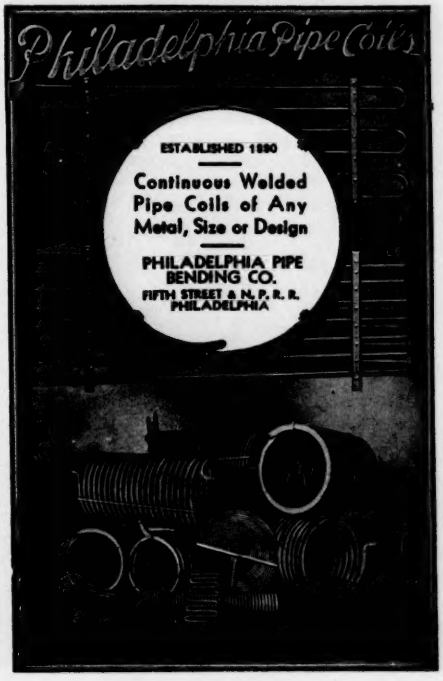
(Buyers Directory continued on next page)

BOWER
B B BRAND
AMMONIA

Purity of product and immediate shipment are two good reasons for specifying Bower Brand. Please keep empty cylinder rotating.

Est. 1850

HENRY BOWER CHEMICAL MANUFACTURING COMPANY
29TH AND GRAY'S FERRY ROAD
PHILADELPHIA 46, PA.

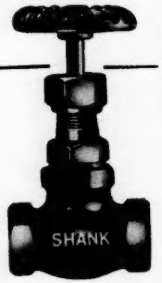

Philadelphia Pipe Coils
ESTABLISHED 1890
Continuous Welded Pipe Coils of Any Metal, Size or Design
PHILADELPHIA PIPE BENDING CO.
FIFTH STREET & N. P. R. R.
PHILADELPHIA

SHANK
REFRIGERATION PRODUCTS

Recognized as The Symbol of Quality

3-WAY DUAL SHUT-OFF VALVE

For use where Refrigeration Codes require dual relief valve installations. Stainless steel stem. Indicator plate on hand wheel shows position of valve shut off. Completely rust-proofed.



SEMI-STEEL SHUT-OFF VALVE

Highest grade non-porous metal—full size ports—clean cut threads. Back seated stem—Shank design base—perfect alignment. Long life packing ring.

If your jobber doesn't stock—write

CYRUS SHANK CO.
629 W. Jackson Blvd. Chicago 6, Ill.

EVAPORATOR PRESSURE CONTROLS

AMMONIA COMPRESSORS

Wolf Linde

Est 1880

FREON VALVES UP TO 12"

AMMONIA VALVES AND FITTINGS

Manufactured and Sold by

DERSCH, GESSWEIN & NEUERT, Inc.

4849 West Grand Avenue Chicago 39, Illinois

THE BUYERS

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CAN DUMPS (Continued)
Martocello & Co., Jos. A., Philadelphia, Pa.
Ohio Galvanizing & Mfg. Co., Niles, Ohio
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

CAR ICING EQUIPMENT
Capital Elevator & Mfg. Co., Columbus, Ohio
Gifford-Wood Co., Hudson, N. Y.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
Tri-Park Machinery Service Inc., Harlingen, Texas

CHEMICALS
Barada & Page, Inc., Kansas City, Mo.

COILS
Acme Industries, Inc., Jackson, Mich.
Byers Co., A. M., Pittsburgh, Pa.
Chicago Nipple Mfg. Co., Chicago, Ill.
Detroit Ice Machine Co., Detroit, Mich.
Howe Ice Machine Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Rempe Company, Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

COLD STORAGE CONSTRUCTION
Armstrong Cork Co., Lancaster, Pa.
Frick Co., Waynesboro, Pa.

COLD STORAGE DOORS
Butcher Boy Cold Storage Door Co., Chicago, Ill.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Jamison Cold Stge. Door Co., Hagerstown, Md.
Refrigeration Engineering Co., Montgomery, Minn.

COMPRESSORS
(See Ice Making and Refrigerating Machinery)

COMPRESSOR VALVE PLATES & DISCS
Voss, Inc., J. H. H., New York, N. Y.

CONDENSERS
Acme Industries, Inc., Jackson, Mich.
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
King-Zeero Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Rempe Company, Chicago, Ill.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

CONSULTING ENGINEERS
Greene, Van R. H., New York, N. Y.
Ophuls & Associates, Fred, New York, N. Y.

CONVEYORS
Capital Elevator & Mfg. Co., Columbus, Ohio
Gifford-Wood Co., Hudson, N. Y.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.

COOLING TOWERS
Frick Co., Waynesboro, Pa.

CORK INSULATION
Armstrong Cork Co., Lancaster, Pa.
Luse-Stevenson Co., Inc., Chicago, Ill.

CORROSION CONTROL
Wright Chemical Control Corp., Chicago, Ill.

COUPON BOOKS
Index Coupon & Supply Co., La Porte, Ind.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

COVERINGS (PIPE AND BOILERS)
American Hair & Felt Co., Chicago, Ill.
Armstrong Cork Co., Lancaster, Pa.

CYLINDERS (GAS & LIQUID)
Byers Co., A. M., Pittsburgh, Pa.

DEIONIZING EQUIPMENT
Industrial Filter & Pump Mfg. Co. Inc., Chicago, Ill.

DEMINERALIZING EQUIPMENT
Industrial Filter & Pump Mfg. Co. Inc., Chicago, Ill.

DIP TANKS AND CAN BASKETS
Frick Co., Waynesboro, Pa.
Ice Plant Equipment Co., Inc. Philadelphia, Pa.
Knickerbocker Stamping Co., Parkersburg, W. Va.
Martocello & Co., Jos. A., Philadelphia, Pa.
Ohio Galvanizing & Mfg. Co., Niles, Ohio
Vogt Machine Co., Henry, Louisville, Ky.

DRIVES, TRANSMISSIONS
Frick Company, Waynesboro, Pa.
Link-Belt Co., Chicago, Ill.

ELEVATING & CONVEYING MACHINERY
Capital Elevator & Mfg. Co., Columbus, Ohio
Gifford-Wood Co., Hudson, N. Y.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.

ENGINEERS AND ARCHITECTS
(See Architects and Engineers)

ENGINES
Frick Co., Waynesboro, Pa.

EVAPORATIVE CONDENSERS
Niagara Blower Co., New York, N.Y.

EVAPORATORS
Acme Industries, Inc., Jackson, Mich.
Frick Co., Waynesboro, Pa.
Niagara Blower Co., New York, N.Y.
Rempe Company, Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

FEED-WATER HEATERS
National Pipe Bending Co., New Haven, Conn.
Vogt Machine Co., Henry, Louisville, Ky.

FIBERGLAS
Armstrong Cork Co., Lancaster, Pa.

FIELD ICE SAWS
Gifford-Wood Co., Hudson, N. Y.
United Ice & Oil Supply Co., Boston, Mass.

FILTERS, CLARIFYING
Industrial Filter & Pump Mfg. Co., Inc., Chicago, Ill.

FILTERS, WATER
Frick Co., Waynesboro, Pa.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Industrial Filter & Pump Mfg. Co., Inc., Chicago, Ill.
Martocello & Co., Jos. A., Philadelphia, Pa.

FILTRATION EQUIPMENT
Industrial Filter & Pump Mfg. Co., Inc., Chicago, Ill.

FIN COILS
Acme Industries, Inc., Jackson, Mich.
Howe Ice Machine Co., Chicago, Ill.
Rempe Company, Chicago, Ill.

FIRST AID SUPPLIES
Acme Protection Equipment Co., Chicago, Ill.

DIRECTORY

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FITTINGS
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

FOOD FREEZING EQUIPMENT
Howe Ice Machine Co., Chicago, Ill.

FROZEN FOOD LOCKERS
Knickerbocker Stamping Co., Parkersburg, W. Va.

FUEL OIL PRE-HEATERS
National Pipe Bending Co., New Haven, Conn.
Rempe Company, Chicago, Ill.

HAND TRUCKS
Ohio Galvanizing & Mfg. Co., Niles, Ohio

HOISTING APPARATUS
Capital Elevator & Mfg. Co., Columbus, Ohio
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Reynolds Mfg. Co., Springfield, Mo.

HUMIDITY AIR CONDITIONERS
Niagara Blower Co., New York, N.Y.

ICE BAGS
International Paper Co., New York, N. Y.
Union Bag & Paper Corp., New York, N. Y.

ICE BLOWERS
Gifford-Wood Co., Hudson, N. Y.
Link-Belt Co., Chicago, Ill.
Tri-Pak Machinery Service, Inc., Harlingen, Texas

ICE CANS
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Martocello & Co., Jos. A., Philadelphia, Pa.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
Knickerbocker Stamping Co., Parkersburg, W. Va.
Ohio Galvanizing & Mfg. Co., Niles, Ohio

ICE CAN FILLERS
Frick Co., Waynesboro, Pa.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Knickerbocker Stamping Co., Parkersburg, W. Va.
Martocello & Co., Jos. A., Philadelphia, Pa.
Ohio Galvanizing & Mfg. Co., Niles, Ohio
Vogt Machine Co., Henry, Louisville, Ky.

ICE CHIPPERS
Capital Elevator & Mfg. Co., Columbus, Ohio
Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Martocello & Co., Jos. A., Philadelphia, Pa.
Index Coupon & Supply Co., La Porte, Ind.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

ICE CHUTES
Frick Co., Waynesboro, Pa.
Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Jamison Cold Storage Door Co., Hagerstown, Md.
Link-Belt Co., Chicago, Ill.
Martocello & Co., Jos. A., Philadelphia, Pa.

ICE CONVEYORS
Capital Elevator & Mfg. Co., Columbus, Ohio
Gifford-Wood Co., Hudson, N. Y.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
Refrigeration Engineering Co., Montgomery, Minn.
United Ice & Oil Supply Co., Boston, Mass.

ICE CREAM PLANTS
Frick Co., Waynesboro, Pa.

ICE CRUSHERS
Bateman Foundry & Machine Co., Inc., Mineral Wells, Texas
Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Index Coupon & Supply Co., La Porte, Ind.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
Martocello & Co., Jos. A., Philadelphia, Pa.
Micron, Inc., Bettendorf, Iowa
Tri-Pak Machinery Service Inc. Harlingen, Texas
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

ICE CUBE CONTAINERS
Index Coupon & Supply Co., La Porte, Ind.
International Paper Co., New York, N. Y.
Lilly Co., The, Memphis, Tenn.
Union Bag & Paper Co., New York, N. Y.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

ICE CUBING MACHINES
Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc. Philadelphia, Pa.
Lilly Co., The, Memphis, Tenn.
Martocello & Co., Jos. A., Philadelphia, Pa.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

ICE DELIVERY BAGS
Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Index Coupon & Supply Co., La Porte, Ind.
International Paper Co., New York, N. Y.
Lilly Co., The, Memphis, Tenn.
Martocello & Co., Jos. A., Philadelphia, Pa.
Union Bag & Paper Corp., New York, N. Y.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

ICE HARVESTING MACHINERY & TOOLS
Gifford-Wood Co., Hudson, N. Y.
United Ice & Oil Supply Co., Boston, Mass.

ICE MAKING AND REFRIGERATING MACHINERY
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Detroit Ice Machine Co., Detroit, Mich.
Enterprise Equipment Corp., Yonkers, N. Y.
Frick Company, Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Ice Plant Equipment Co., Inc. Philadelphia, Pa.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

ICE PICKS AND PLANERS
Gifford-Wood Co., Hudson, N. Y.
Halsey Mfg. Co., Inc., Evansville, Ind.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Index Coupon & Supply Co., La Porte, Ind.
Lilly Co., The, Memphis, Tenn.
Martocello & Co., Jos. A., Philadelphia, Pa.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

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WEATHERPROOFED ICE SIGNAL CARDS

Coated Both Sides With Paraffine

ANY COLOR

ANY SIZE

We Make Any Design of Ice Signal Card

Send In Your Individually Designed Cards for Quotation

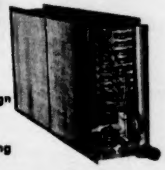
Write for Ice Signal Card Circular and Prices

Index Coupon & Supply Co.
LaPorte, Indiana

for Highest Quality
LOOK TO REMPE!

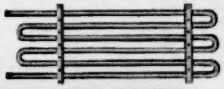
PIPE COILS • FIN COILS
For **Refrigeration, Air Conditioning, and Heating**

Rempe Coils are accepted in the industry as quality equipment that is built for long service without maintenance. Rempe Coils are used on the most difficult jobs and forgotten. This confidence has been earned the hard way—through proper engineering, good quality materials and precision manufacturing.



Coils and Bends of any metal or design engineered to your requirements.
Send us your problems for engineering assistance.

REMPE CO.

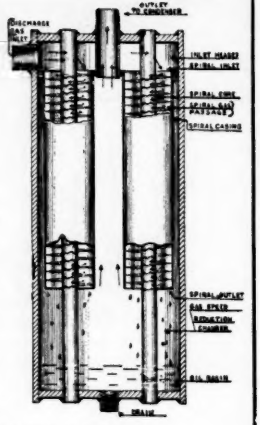


REMPE COMPANY
340 N. Sacramento Blvd., Chicago 12, Ill.

"King Zeero"

OIL SEPARATOR

STOPS OIL FROM ENTERING CONDENSER RECEIVER AND LOW SIDE



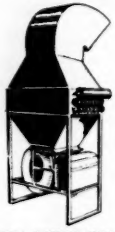
Allows operation as was originally intended. Simple in operation — no parts to wear out — no screens, metal wool or any close screens to clog, raise discharge pressures and cut down capacity.

When used in connection with air compressors, water is also separated with the oil.

Built for years of trouble free service. Mechanical details on request.

THE KING ZEERO COMPANY
1447-55 Montrose Ave., Chicago 13, Ill.

How to Correct Inefficient Pressures and Temperatures



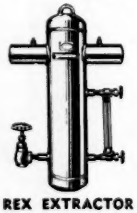
REX SUPER-HEAT EXTRACTOR

REX REFRIGERATION EQUIPMENT

Eliminates excessive power and labor which greatly increases cost to produce required refrigeration.

REX SUPER-HEAT EXTRACTOR

Extracts super-heat from discharge gas before it reaches the condenser. Gives you these advantages — (1) Uses less water per ton of refrigeration. (2) Refrigeration capacity may be increased without overloading the motor or—the discharge pressure may be reduced without reducing the plant capacity. *SAVES 20% IN POWER COSTS.*



REX EXTRACTOR

REX EXTRACTOR

(1) Eliminates lubricating oil and water vapor carried over from the ammonia compressors with a minimum of pressure drop. (2) Outperforms a surge drum or an accumulator in the suction line. Raises tonnage. Refrigeration plant operates more efficiently.

Send for your copy of COLD FACTS —for the Refrigeration Engineer.

REX ENGINEERING & SALES CO.
Oklahoma City, Oklahoma
BOX 5141

THE BUYERS

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ICE PICK SCABBARDS
Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
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Martocello & Co., Jos. A., Philadelphia, Pa.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

ICE PICK VENDING MACHINES
Halsey Mfg. Co., Inc., Evansville, Ind.
United Ice & Oil Supply Co., Boston, Mass.

ICE PLANTS
Enterprise Equipment Corp., Yonkers, N. Y.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.

ICE SCALES
Gifford-Wood Co., Hudson, N. Y.
Index Coupon & Supply Co., La Porte, Ind.
Lilly Co., The, Memphis, Tenn.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

ICE TOOLS
Gifford-Wood Co., Hudson, N. Y.
Halsey Mfg. Co., Inc., Evansville, Ind.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Index Coupon & Supply Co., La Porte, Ind.
Lilly Co., The, Memphis, Tenn.
Martocello & Co., Jos. A., Philadelphia, Pa.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

ICE VENDORS
Frick Company, Waynesboro, Pa.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Jamison Cold Storage Door Co., Hagerstown, Md.
Refrigeration Engineering Co., Montgomery, Minn.
S & S Vending Machine Co., San Jose, Calif.
United Ice & Oil Supply Co., Boston, Mass.

ICED PICNIC BASKET
Rey Co., The, Milwaukee, Wis.

INSTANTANEOUS HEATERS
National Pipe Bending Co., New Haven, Conn.

INSULATING MATERIALS
American Hair & Felt Co., Chicago, Ill.
Armstrong Cork Co., Lancaster, Pa.
Hogan & Co., Inc., C. T., New York, N. Y.
Luse-Stevenson Co., Inc., Chicago, Ill.
Pacific Lumber Co., San Francisco, Calif.

INSULATION ADHESIVES
American Bitumuls Co., San Francisco, Calif.

LOW TEMPERATURE EQUIPMENT
(See Ice Making and Refrigerating Machinery)

MASKS, AMMONIA
Acme Protection Equipment Co., Chicago, Ill.

MATERIALS HANDLING EQUIPMENT
Ohio Galvanizing & Mfg. Co., Niles, Ohio

OIL AND LUBRICANTS
Socony-Vacuum Oil Co., Inc., New York, N. Y.
Sun Oil Co., Philadelphia, Pa.
Texas Co., The, New York, N. Y.

OILS, CUTTING
Socony-Vacuum Oil Co., Inc., New York, N. Y.
Sun Oil Co., Philadelphia, Pa.
Texas Co., The, New York, N. Y.

OIL SEPARATORS
King-Zeero Company, Chicago, Ill.
Rex Engineering & Sales Co., Oklahoma City, Okla.

OILS, FUEL
Socony-Vacuum Oil Co., Inc., New York, N. Y.
Sun Oil Co., Philadelphia, Pa.
Texas Co., The, New York, N. Y.

PACKINGS
Frick Company, Waynesboro, Pa.
Vivian Mfg. Co., St. Louis, Mo.

PIPE COILS AND BENDS
Acme Industries, Inc., Jackson, Mich.
Chicago Nipple Mfg. Co., Chicago, Ill.
Frick Company, Waynesboro, Pa.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Rempe Company, Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

PIPE WELDING
Acme Industries, Inc., Jackson, Mich.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

PIPING
Acme Industries, Inc., Jackson, Mich.
Byers Co., A. M., Pittsburgh, Pa.
Frick Company, Waynesboro, Pa.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Rempe Company, Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

PORTABLE ICE BASKET
Rey Co., The, Milwaukee, Wis.

PRESSURE BLOWERS
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Martocello & Co., Jos. A., Philadelphia, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

PROPELLERS
Ice Plant Equipment Co., Inc., Philadelphia, Pa.

PROTECTIVE DEVICES
Safety Head Control Co., Chicago, Ill.

PUMPING MACHINERY
Aurora Pump Co., Aurora, Ill.
Deming Co., The, Salem, Ohio
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Layne & Bowler, Inc., Memphis, Tenn.
Roots-Connersville Blower Corp., Connersville, Ind.

PUMPING MACHINERY—AIR LIFT
Deming Co., The, Salem, Ohio
Roots-Connersville Blower Corp., Connersville, Ind.

PUMPS, AMMONIA AND BRINE
Deming Co., The, Salem, Ohio
Frick Company, Waynesboro, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.
Vogt Machine Co., Henry, Louisville, Ky.

PUMPS, DEEP WELL
Aurora Pump Co., Aurora, Ill.
Deming Co., The, Salem, Ohio
Layne & Bowler, Inc., Memphis, Tenn.

PUMPS, ROTARY
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Deming Co., The, Salem, Ohio
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

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Frick Company, Waynesboro, Pa.
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Martocello & Co., Jos. A., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

REBOILERS
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Vogt Machine Co., Henry, Louisville, Ky.

REFRIGERATED ICE STATIONS
Refrigeration Engineering Co., Montgomery, Minn.
S & S Vending Machine Co., San Jose, Calif.

REFRIGERATING AND ICE MAKING MACHINERY
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United Ice & Oil Supply Co., Boston, Mass.

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WELL SCREENS
Layne & Bowler, Inc., Memphis, Tenn.

WROUGHT IRON PIPE
Byers Co., A. M., Pittsburgh, Pa.

Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: $3.50 for 50 words or less; 60c for each additional 10 words or fraction thereof; 75c per line for bold face headings; $8.00 per inch for line listings.

POSITIONS AND HELP WANTED

POSITION WANTED—Warehouse executive, interested in relocating. Over twenty years experience in all phases refrigerated and general merchandise warehousing. Presently employed as general manager of medium sized operation. Excellent references. Address Box JU-7, Ice and Refrigeration, 435 N. Waller Ave., Chicago 44, Ill.

POSITION WANTED—Refrigeration man of wide experience on cold storage, ice cream, frozen food and ice plant service. Have serviced Freon air conditioning and commercial plants. Have supervised erection of various sizes of plants for both Freon and ammonia. Am now operating large Freon system for ice skating rink. Will relocate. Address Box JU-4, Ice and Refrigeration, 435 N. Waller Ave., Chicago 44, Ill.

ICE PLANTS—for sale

FOR SALE—27 ton electric York plant. 125 h.p. Worthington oil engine, driving electric machine generator. Natural gas or electricity can be bought. Write Box 681, Flat River, Missouri.

FOR SALE—18 ton ice plant. Rebuilt in 1947. Large industrial, farming and oil community. One 9x9 and two 5x5 compressors. Gas powered engine. Blower type condenser. Would pay out in two good seasons. Per ton $1200. Immediate possession. Write P. O. Box 486, Stroud, Okla.

FOR SALE—Complete 100 ton ice plant, except ammonia compressors. Two ice tanks each containing 640-400# cans. Two 2 ton cranes and overhead equipment. Two air compressors. Four submerged type shell coolers. Four vertical agitators. Lime-soda softener complete with gravel filter. Two dehydrators; core pump; one Uline ice scoring machine. One ice crusher with ice sizing cylinder. One Uline ice cuber. Plenty of extras. Great Lakes Terminal Warehouse Co., 321-359 Morris St., Toledo 4, Ohio.

FOR SALE
Complete 50-ton Ice Plant

near Detroit. Just shut down. Available at once. For details call Woodward 3-6140 collect

or write

L. L. ADAMS
2615 12th St., Detroit 16, Mich.

FOR SALE OR LEASE
90-TON CAPACITY
ICE MAKING PLANT
SUITABLE FOR COLD STORAGE FILLING STATION IN CONNECTION ON MAIN ARTERY NORTH AND SOUTH EAST AND WEST THRU FAST GROWING MIDWEST CITY OF 200,000 POPULATION.

WRITE BOX MY-5

ICE and REFRIGERATION
435 N. Waller Av.
Chicago 44, Ill.

Don't try to compete with yourself by using that machine in your plant which is too small for the job! Scan these pages for the things you need and sell your small equipment through a want ad.

FOR SALE—ICE PLANTS & EQUIPMENT

20-40-50-60 Ton Ice Plants — Immediate Sale
1—60 Ton Cap Vogt Tube Ice Machine. Complete with Compressors.
1—12"x12" Duplex Frick Ammonia Compressors direct connected to synchronous motor.
1—10"x10" York ammonia compressor direct connected to 60 H.P. synchronous motor 200 R.P.M.
1—10"x10" York ammonia compressor direct connected to 100 H.P. synchronous motor 200 R.P.M.
1—9"x9" ammonia compressor direct connected to 50 H.P. synchronous motor 200 R.P.M.
1—10"x10" York ammonia compressor 200 R.P.M.
1—8"x8" York ammonia compressor direct connected to 60 H.P. synchronous motor 360 R.P.M.
1—8"x8" York Ammonia Compressor High Speed.
1—6"x6" York Ammonia Compressor High Speed.
1—5"x5" York Ammonia Compressor High Speed. Can supply motors for all compressors.
1—6"x6" Voss ammonia compressor.
2—4"x4" H.S. self contained Units, York.
1—3"x3" Frick H.S. self contained Units.
1—25" dia.x10'-0" long 5 pass enclosed type ammonia condensors.
1—Horizontal Shell and Tube Condensors 39½" Dia.x14'-1" long 152-2" tubes 6 pass. Assorted sizes electric hoists and cranes ranging from 2 to 6 ton capacity.
2—Gifford & Wood Tiering Machines, 1-three and 1-four tier.
2—Gifford & Wood Creasey Ice Crushers, Various Sizes.
3—Scoring Machines Perfection.
2—Sheppard Cranes 4 and 5 ton capacities—3 motor jobs.
2000—Ice Cans, various sizes.
Brine Coolers, submerged shell and tube type, 1¼" and 2" ammonia coils, approximately 10,000 feet.

Send Us Your Requirements on Any Equipment You May Need.

ENTERPRISE EQUIPMENT CORPORATION
77-79 Alexander Street, Yonkers, N. Y.
Phone: Yonkers 8-8118-9
Cable Address: ENEQCO

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Classified Advertising

USED EQUIPMENT-wanted & for sale

WANTED — One Gifford-Wood crusher and blower No. 240. Also Bateman loader and shaker sizer. Strain Brothers Inc., Lamar, Colorado.

FOR SALE—1500 ice cans 11x22x47-48—good condition, $2.25 each F.O.B. 1500 brass drop tubes 50c each. C. Hoffberger Company, 1517 N. Gay St., Baltimore 13, Maryland.

FOR SALE—6x6 and 7½x7½ high speed Yorks. 4x4, 3x3, self-contained Yorks. 3x3, 4x4, 5x5, 6x6, 7½x7½, 8x8, and 9x9 Yorks, splash lubrication. 20"x8' and 16"x12' receivers. One 10 ton York blower unit. Two 25 ton shell & tube condensers. Three Freon suspended type blower units. One 2 ton Niagara ammonia blower. Write E. Niebling, 1546 St. Clair Ave., Mt. Healthy, Cincinnati 31, Ohio.

For Sale

3—7¾"x5" Frick Ammonia Booster Compressors with inter coolers and float controls.

1—14"x10" York Booster Compressor—'V' belt drive.

WRITE
Box MY 14
Ice and Refrigeration
433 N. Waller Ave. Chicago 44, Ill.

USED EQUIPMENT-Continued

COLD STORAGE EQUIPMENT

First-class condition; Dallas plant converting to dry storage. Frick compressors, 9x9; Bruce 180 & 165 H.P. engines. 125 KVA AC generators, etc. Catalogue on request.

A A A IRON & METAL CO.
2401 Canton Dallas, Texas

"... *your time is money*"

... don't waste it by looking around for personnel or items to make your organization more efficient. A classified ad in Ice and Refrigeration will do the job for you quickly and at low cost. No matter what you need or have to sell, one of our readers will have it or want it. The same goes for personnel.

Rates are shown at the beginning of this section — closing date is the tenth of the month.

May we serve you?

USED EQUIPMENT-Continued

FOR SALE—"Miller Type" Perfection ice scoring machine for 400 lb. blocks, in good condition, price $400.00. White Frost Ice Co., 453 Main St., Anderson, Ind.

FOR SALE—Brand new latest type ammonia compressors. One 8"x8" Frick, two 5"x5" Worthingtons, one 5½"x5½" Vilter, all with V belt drives; also new 60 h.p. motor. All just as received from the factories. Address Box AP-19, Ice and Refrigeration, 435 N. Waller Ave., Chicago 44, Ill.

FOR SALE

60 ton Vogt Automatic Tube-Ice Machine
30 ton York Ice Plant—Electric Driven
10 x 10 York Ammonia Compressor
(2) 100 H.P. 300 R.P.M. Synchronous Motors—new 1948
Miller Ice Scoring Machine

JOHN F. CARSON
2829 N. Broad St. Philadelphia 32, Pa.
BAldwin 9-5932

FOR SALE—20 ton Arctic-Pownall plant with two 9x9 compressors, as plant or any parts. York, Baker, Lipman self-contained units; Frick 6x6; York 9x9; two Vilter Freon units with motors. Brine coolers, condensers, pipe coils, receivers, oil traps, agitators, motors. Parke Pettegrew & Son Co., 370 W. Broad St., Columbus 8, Ohio.

FOR SALE—2 Polar Automatic vending machines 14 ft. long, 2 belts high, suitable for block or bagged ice, complete with Polar fool proof coil mechanisms, trap doors and chutes. Guaranteed like new. Used two months. Bought new last spring. $1250 or $625 each. Write Guymon Ice Plant, Guymon, Okla.

ICE PLANT DISSOLVED

Must Dispose of all Equipment

No reasonable offer refused

ICE SCORING MACHINES
Gifford-Wood "Uline"—In operation one season.

ICE CANS—1500—Like new—For 300 lb. ice blocks—Arranged in baskets of 6 cans ea.

BRINE AGITATORS

CENTRIFUGAL AIR COMPRESSOR—GE.

AMMONIA VALVES—All sizes.

ACCUMULATORS—Ammonia-Vilter.

ICE CUBING MACHINES—Automatic—Flynn—Emrich—Type 100—Capacity 100 lbs.—In operation one season.

ICE CRUSHER—Creasey-Mfge. by Gifford-Wood Co.—25 lbs.

CAN FILLER TANKS

ICE DUMPS

3—CARLOADS BLACK PIPE—Like New—½" to 8"

MISC. EQUIPMENT

GIVE US

A TRY...

YOU WILL BUY

ROSEN-NOVAK AUTO CO.

2558 FARNAM ST. PHONE: HA6090 OMAHA, NEBRASKA

Classified Advertising

USED EQUIPMENT—continued

FOR SALE—York 3x3 self-contained ammonia compressor with 5 h.p. induction motor. Capacity 2 ton of refrigeration when operating at 25# suction and 180# discharge. Sharon Ice & Coal Co., 230 W. Budd St., Sharon, Penna.

FOR SALE—New refrigeration valves, flanged fittings and nipples. All Crane, Vogt or Henry. ½" to 3". First class condition. Sell all or part at our cost and pay freight. Send for complete list with description and price. The Creamery Package Mfg. Co., 90 Franklin St., Nashville, Tenn.

FOR SALE — ICE PLANTS & EQUIPMENT

5—10-30-50 ton complete ice making plants.
1—10x10 York ammonia compressor 225 r.p.m.
1—9x9 York ammonia compressor direct connected to a 75 h.p. synchronous motor.
1—9x9 York 200 r.p.m.
1—8x8 Frick 360 r.p.m.
1—7½x7½ York with 40 h.p. motor, 360 r.p.m.
1—6½x6½ York with capacity control valves, 360 r.p.m.
1—6½x6½ York 360 r.p.m.
1—6x6 Frick 360 r.p.m.
1—5x5 York self-contained unit.
1—5x5 York 360 r.p.m.
1—4x4 York self-contained unit.
2—3x3 York or Frick self-contained units.
Motors and starters for all compressors.
1000 ice cans, various sizes.
Condensers, brine coolers, cranes, can dumps, can fillers, etc. Send us your requirements on any equipment you may need.

B & E REFRIGERATING CO.
2 Orange St., Newark 2, N. J.
Phone: Mitchell 3-7790 Cable Address "BERECO"

USED EQUIPMENT—continued

FOR SALE — OVERSTOCK, GOOD DISCOUNT. New merchandise; Baker ammonia compressor 9¼x9¼ VSA 2 cyl, AC & DC motors 1/10 to 10 hp., Frick 4⅜"x4¼" compressors, 4 cyl., 4 Frick 4⅜"x4¼" compressors, 6 cyl., motor starter 75 h.p., misc. gear oil pumps, York ammonia liquid pump, 3"x2" w/motor, Pennsylvania pump w/15 h.p. motor 600 gpm at 60', Viking rotary grease pump with GE 1½ h.p. motor, Hoffman blower LR25 220 cfm at 2½ lbs. w/5 h.p. motor. Cold storage doors, 24"x30", super freezer doors 4'x6' (Jamison) and 3'6"x3' (Streator). Large assortment of Baker machine parts, Baker and Frick ammonia fittings, iron fittings, gaskets, ammonia valves, reach in doors, V belts, sheaves and hard to find items. Write us your requirements. Box 367, Fort Worth 3, Texas.

Don't ● ● or by
let your ● ● doing a
profits go ● ● job the old
"south by ● ● way when a
having a piece ● ● classified ad
of idle machinery ● ● will find a buy-
that can be con- ● ● er or the equip-
verted into cash ● ● ment you require.
●

USED EQUIPMENT—continued

FOR SALE—We have for sale or trade, one complete refrigeration outfit. Will carry a room 20x70 at 20 degrees. This equipment is in good shape. Cost $6,000.00; will trade for a SS vending station. The Hynes Ice & Cold Storage Co., P.O. Box 566, Canon City, Colo.

FOR SALE—USED EQUIPMENT

1—35 ton York low pressure, electric drive, synchronous motor driven, 4 can lift, well pumps vertical shell & tube condenser, piping, panels complete.
3—100 ton York and Frick ice plants.
1—50 ton York ice plant.
1—70 ton Vilter ice plant.
1—200 ton York ice plant.
1—120 ton York ice plant.
1—400 ton York ice plant.
2—300# Champion ice crushers with 7½ h.p. motors, with hoppers and chutes.
1—Model F Gifford-Wood 2 way scoring machine.
1—Perfection 2 way scoring machine.
3—Tiering machines, 4-6-8 Tiers.
1—Gifford-Wood Model #560 Ice Crusher, in original crate.
1—90 ton horizontal shell and tube condenser.
500—11"x22"x47" ice cans, good condition.
500—11"x22"x50" ice cans, good condition, LIKE NEW.
1—4x4 York self-contained unit, 5 h.p.
102—Door type Master lockers, 15"x24"x30".
102—Drawer type Master lockers, 16"x24"x30".
1—Model 54-Y Creasey ice crusher, belt drive.
Conveyor chain—6" pitch.
Send us your requirements on equipment you need.

UNITED SUPPLY & EQUIPMENT CO., INC.
55 Beverly Street Boston 14, Mass.

USED ICE MACHINES AND EQUIPMENT

All Used Equipment Is Reconditioned In Our Modern Machine Shop
THIS IS ONLY A PARTIAL LIST-WRITE ABOUT ANY REQUIREMENTS WHICH YOU HAVE
WE ARE BUYING ADDITIONAL EQUIPMENT ALL OF THE TIME

Compressors With or Without Motors

	Item No.
1—4x4 York, 300 RPM	16
6—6x6 York's, 200 RPM	20
1—6x6 Frick, 257 RPM	21
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1—8x8 York—Direct connected to 50 HP Fairbanks-Morse at 257 RPM	210

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1—8x8 Vertical York, 300 RPM direct connected	327

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10,000 feet wrought Iron pipe—2"—like new	451

Complete Ice Plants

1—15-ton electric driven plant	630
1—600 Can Trunk Coil Type—York Plant, Brand New Tank. *Complete with 10 Can Grids. This plant is equal to new*	631
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2—4 Ton Overhead Traveling Cranes. 9 & 12 Can Grid.	

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3—100 ton shell and tube condensers retubed	919
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2—20 ton Horizontal—retubed	924

Ice Cans

2000 Cans—Like new—11"x22"x47"	950

ROBERT P. KEHOE MACHINERY CO., Inc.
REFRIGERATION EQUIPMENT
6 EUCKER STREET
RIDGEFIELD PARK N J
PHONE: DIAMOND 2-8554
CABLE ADDRESS: KEHOEINC

TRI-PAK

MOBIL-ICERS for Crushed Ice ANYWHERE

Model M-337

40 to 50 TON of CRUSHED ICE PER HOUR!

You can't take chances on your supply of crushed ice for protecting perishables. A Tri-Pak crusher-slinger will always give you crushed ice anytime . . . anywhere. These units are built in five models, both gasoline and electric powered, to give you the exact capacity you need at the lowest possible cost. Only two operators are required . . . one to slide full-sized blocks of ice into the crusher and the other to direct the slinger nozzle.

Model G-100

All Tri-Pak crusher-slingers are strongly built of welded steel to give you years and years of low-cost service. Rigid "X" frames carry the crusher and slinger and either a husky electric motor or a Ford industrial power unit. You can't match a Tri-Pak crusher-slinger for rugged, efficient operation.

TRI-PAK Machinery SERVICE INC.

Write today for your TRI-PAK BOOKLET which helps you select the crusher slinger you need.

HARLINGEN, TEXAS

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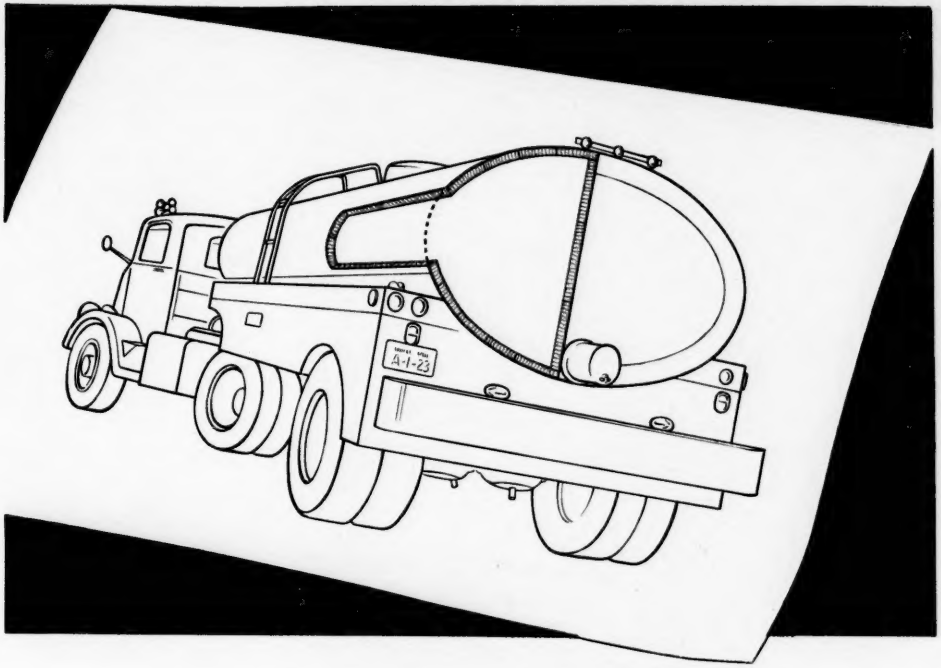


WHAT IS THE BEST INSULATION FOR A MILK TANK TRUCK?

With most types of refrigerated equipment it is just about impossible to name a "one best" insulation. Individual model design determines which materials will work best. In the case of milk tank trucks, however, one insulation stands out as the logical choice for the job. That insulation is corkboard.

Corkboard's high strength and resistance will help support the outer cover of the tank and the weight of the load, greatly reducing the number of structural supports required. It can be fastened securely in place, eliminating the possibility of displacement of the insulation.

The high insulating efficiency of Armstrong's Corkboard allows little rise in temperature in a tank of milk and, in the event of delay, reduces the danger of spoilage and loss of the load. Because of its high natural resistance to moisture, corkboard stays dry and efficient, is not subject to loss of insulating value that occurs when other insulating materials become wet.

There are few other types of refrigerated equipment, however, where you can standardize on a single insulation. That's why there's a great advantage in asking experienced Armstrong engineers to help you with your insulation problems. These men can make their recommendations from a complete line of insulations. In addition to LK® Corkboard, the rigid, load-bearing insulation, there are Temlok®, a strong, efficient fiberboard and several types of Fiberglas*, the light, resilient, glass fiber insulating material.

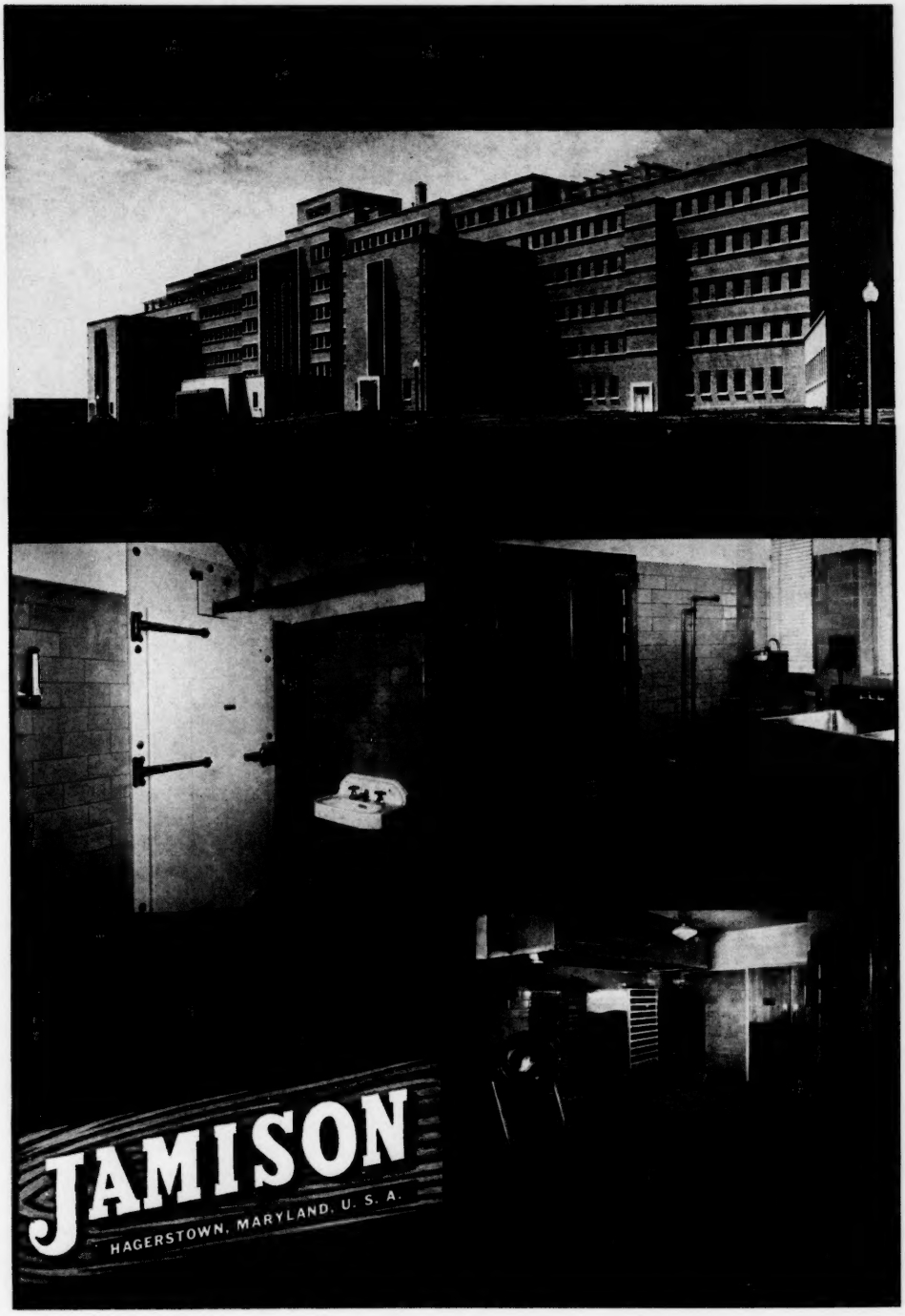
To see how well our recommendations will work, we'll test your new design models in Armstrong's Life Test Room.

For additional information, call the nearest Armstrong Office or write today to Armstrong Cork Co., 4506 Queen St., Lancaster, Pa.

*® OCF CORP.

ARMSTRONG'S EQUIPMENT INSULATION

LK CORKBOARD • FIBERGLAS • TEMLOK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